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IDENTIFIERS	*Durham Education Improvement Program; Stanford Binet Test

ABSTRACT

Effects are reported of a Durham, North Carolina Education Improvement Program (EIP), a five-year compensatory education program, on social, intellectual, linguistic, and academic development of disadvantaged children. Regarding socialization, changes in social behavior are found to be more a function of specific setting variables, especially teacher behavior, than entry age. The program also reverses the decline in tested IQ after age two in children with no pre-school experience, and it in fact increases his Stanford-Binet score. Although the program does not seem to have different effects on language development in comparison with children in various control groups, it is significantly more effective if continued for two school years or more and when the age of entry is four years. However, in regard to academic performance, the children in the Education Improvement Program are not found to perform as well as children at the end of the first year of primary school. After two or three years of the EIP ungraded primary experience, the EIP pupils on the average score higher than their controls, but the differences are non-significant. (LH)

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AERA Paper
Chicago, Apr

Effects of a Five-Year Compensatory Education Program on Social, Intellectual, Linguistic, and Academic Development[1]

Robert L. Spaulding[2]
San Jose State College

During the mid-nineteen-sixties the Ford Foundation funded five large scale ea "education improvement projects" in the South in an effort to stimulate innovation a existing educational systems and demonstrate the feasibility of compensating for ear nomic, and cultural deprivation through massive educational interventions in the liv taged youngsters. One of the five projects funded was located in Durham, North Caro

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1. Knowledge regarding the early health status of disadvantaged child

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The author wishes to acknowledge the generous support of Everett H. Hopkins of Du the able leadership of Donald J. Stedman of the University of North Carolina in plan the Durham project.

[2] Requests for reprints should be sent to R.L. Spaulding, School of Education, San San Jose, California 95114.

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2. Discovery and dissemination of appropriate methods of child care in low-income settings;

3. Identification of typical child rearing patterns associated with educational and intellectual development;

4. Demonstration of model patterns of preschool education;

5. Development of support in the community and region for state funded Kindergartens;

6. Development of city and county school readiness screening techniques;

7. Improvement of existing early educational programs;

8. Improvement of educational programs at all age levels;

9. Development of predictors of readiness and the improvement of preschool readiness programs;

10. Improvement of junior and senior high school counseling programs for community and family life;

11. Introduction of new educational roles (new career opportunities);

12. Development of an objective monitoring system for new educational programs;

13. Improvement of in-service and pre-service teacher training programs in the Durham public schools, at Duke University and North Carolina Central University;

14. Improvement of coordination between the public schools and local universities;

15. Development of a significant emphasis on an early childhood educational component in the concurrently funded OEO anti-poverty program in Durham;

16. Provision of new preschool educational techniques to private and parochial schools;

17. Provision of a model instructional system for state and national observation; and

18. Stimulation of community interest and participation in the improvement of the public schools.

The effects of the 5-year project with respect to many of these broad goals ha
previously (Spaulding, 1971). In this paper results regarding some specific questio
are reported.

Specific Questions

In addition to the broad goals given above a number of specific questions were
them were these:

1. What are the relative effects of intervening at age 2 in compariso
tion at ages 3, 4, 5, or 6?

2. What are the relative effects of variations in length of early edu
vention? That is, do children enrolled for two years demonstrate
ment than children enrolled for one year? Would a three-year educ
vention be more effective than a two-year compensatory program?

3. Is there an interaction between age of entry to the experimental p
length of enrollment (effecting intellectual development and subse
achievement)?

4. What is the pattern of change before, during and after the experim
tory intervention? Are gains (in social skills, I.Q., language pe
academic skills) made uniformly throughout the treatment period?
I.Q. take place in early childhood prior to intervention and how a
affected by the treatment? Are they terminated, reversed, or othe
by the compensatory program?

Hypotheses

A number of specific effects on the development of the children in the experim
were predicted. These effects were framed as hypotheses, as follows:

Hypothesis 1

The effect of the experimental social behavior modification treatm
program will be to increase obedient, conforming behavior in teacher-d
settings.

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Questions

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these:

1. What are the relative effects of intervening at age 2 in comparison with intervention at ages 3, 4, 5, or 6?

2. What are the relative effects of variations in length of early educational intervention? That is, do children enrolled for two years demonstrate greater improvement than children enrolled for one year? Would a three-year educational intervention be more effective than a two-year compensatory program?

3. Is there an interaction between age of entry to the experimental programs and the length of enrollment (effecting intellectual development and subsequent school achievement)?

4. What is the pattern of change before, during and after the experimental, compensatory intervention? Are gains (in social skills, I.Q., language performance, or academic skills) made uniformly throughout the treatment period? What losses in I.Q. take place in early childhood prior to intervention and how are such trends affected by the treatment? Are they terminated, reversed, or otherwise modified by the compensatory program?

umber of specific effects on the development of the children in the experimental programs
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Hypothesis 1

The effect of the experimental social behavior modification treatments used in the program will be to increase obedient, conforming behavior in teacher-directed classroom settings.

Hypothesis 2

The effect of the experimental social behavior modification treatmen increase independent, productive, assertive behavior in non-teacher-dire room settings (such as seat work or programmed learning situations).

Hypothesis 3

The effect of the experimental educational programs will be to impro lectual performance of the pupils to the point where the distribution of Binet I.Q. scores approximates the national norm (that is, a mean of 100 deviation of 16).

Hypothesis 4

The effect of the experimental educational programs will be to impro performance of pupils to the point where, by the end of the third year o primary the distribution of their achievement scores on the Metropolitan Test (MAT), Elementary Form, will equal or exceed the national norms for

Hypothesis 5

Pupils who participate in the experimental ungraded primary will sho classroom behavior (specifically, cooperative, docile, conforming behavi directed settings and independent-productive, assertive, socially integr in non-teacher-directed settings) than control children who have not exp experimental behavior modification and ungraded instructional programs.

METHODS

A small scale school system was created enrolling from 200 to 300 children from (A, B, C, D) in Durham City and County. The four areas may be characterized as follow

Area A - An inner-city, low-income Black community undergoing severe dis about by urban renewal and the building of an interstate type h the community.

Area B - An inner-city, bi-cultural low-income residential community als urban renewal plans. Formerly an all white community, Area B w 30 percent Black when project personnel surveyed the area in 19

Hypothesis 2

The effect of the experimental social behavior modification treatments will be to increase independent, productive, assertive behavior in non-teacher-directed classroom settings (such as seat work or programmed learning situations).

Hypothesis 3

The effect of the experimental educational programs will be to improve the intellectual performance of the pupils to the point where the distribution of their Stanford-Binet I.Q. scores approximates the national norm (that is, a mean of 100 and a standard deviation of 16).

Hypothesis 4

The effect of the experimental educational programs will be to improve the academic performance of pupils to the point where, by the end of the third year of the ungraded primary the distribution of their achievement scores on the Metropolitan Achievement Test (MAT), Elementary Form, will equal or exceed the national norms for the test.

Hypothesis 5

Pupils who participate in the experimental ungraded primary will show more desirable classroom behavior (specifically, cooperative, docile, conforming behavior in teacher-directed settings and independent-productive, assertive, socially integrative behavior in non-teacher-directed settings) than control children who have not experienced the experimental behavior modification and ungraded instructional programs.

METHODS

l scale school system was created enrolling from 200 to 300 children from four target areas in Durham City and County. The four areas may be characterized as follows:

Area A - An inner-city, low-income Black community undergoing severe dislocations brought about by urban renewal and the building of an interstate type highway through the community.

Area B - An inner-city, bi-cultural low-income residential community also affected by urban renewal plans. Formerly an all white community, Area B was about 20 to 30 percent Black when project personnel surveyed the area in 1965.

Area C - An all Black suburban, semi-rural community with a history of
stability. Although equally poor in economic terms, the famili
experienced fewer of the disruptions and dislocations of commun
acteristic of the inner-city target areas.

Area D - A neighborhood of contrasting pockets of poverty, encompassing
Black and white communities. Adjacent to the University it als
families and became the location of the project laboratory scho

In each of these target areas a door to door survey was made to obtain the names
From these survey lists names of children were drawn randomly to form initial classroo
two through six. Subsequently, existing classroom groups in the public schools in the
were enrolled in the program. Control groups were obtained in the same manner.

Support services included a social service component, a psychological consultati
Duke University, a health service component, a public information office, a research a
diwision, an instructional materials center and an in-service instructional training c

Classroom programs varied from school to school and each teaching team developed
individualizing instruction. The teacher training program emphasized behavior modific
means of social control and the use of inductive discovery techniques in the developme
concepts. Teachers and children were observed daily and behavioral goals were set usi
Analysis Schedule for Educational Settings (CASES) (Spaulding, 1970).

The methods of classroom instruction promoted in the project included the follow

1. Discovery pedagogy in structured subject-matter fields (e.g. mathema

2. Direct, expository teaching in motor skill development and in subjec
structured arbitrarily or by custom (e.g. handwriting, the alphabet)

3. Programmed learning when materials were found consistent with items

4. Individualized, ungraded, non-competitive instruction;

5. Use of CASES instructional and behavioral control treatments as indi
manual of treatments according to individual pupil coping style;

6. Avoidance of aversive punishment as a means of social control;

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Area C - An all Black suburban, semi-rural community with a history of local pride and stability. Although equally poor in economic terms, the families living there experienced fewer of the disruptions and dislocations of community life characteristic of the inner-city target areas.

Area D - A neighborhood of contrasting pockets of poverty, encompassing both low-income Black and white communities. Adjacent to the University it also housed student families and became the location of the project laboratory school.

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1. Discovery pedagogy in structured subject-matter fields (e.g. mathematics and reading);

2. Direct, expository teaching in motor skill development and in subject-matter fields structured arbitrarily or by custom (e.g. handwriting, the alphabet);

3. Programmed learning when materials were found consistent with items 1 and 2 above;

4. Individualized, ungraded, non-competitive instruction;

5. Use of CASES instructional and behavioral control treatments as indicated in the CASES manual of treatments according to individual pupil coping style;

6. Avoidance of aversive punishment as a means of social control;

7. Problem-oriented instruction consistent with each child's level of development, skill, knowledge, and social maturity.

8. Academic goals based on Piaget's developmental theory (making use o experience as a foundation for concept development, with the child' spected, and the attachment of labels made following concept develo concrete experience);

9. Restriction of rote process to non-logical structures of high utili memorization of alphabetical order).

10. Encouragement of talking in association with concrete experience in to extend, sharpen, and validate pre-concepts; and

11. Extensive use of dramatic play techniques using concrete materials social skills, knowledge, and academic motivation.

The programs developed in Target Areas A, B, and C were modeled after instructi pilot tested in the laboratory school (Target Area D). From the beginning all classe and individualized, and all teachers employed programmed instructional materials. Dr techniques, however, were restricted largely to the laboratory school. Discovery ped in all classes to some extent, but it constituted a major instructional factor only i

Non-punitive control techniques (using principles of behavior modification) wer established throughout the four schools by the third year, after two years of major s teachers learning the reinforcement strategies.

7. Problem-oriented instruction consistent with each child's level of intellectual development, skill, knowledge, and social maturity.

8. Academic goals based on Piaget's developmental theory (making use of concrete experience as a foundation for concept development, with the child's logic respected, and the attachment of labels made following concept development through concrete experience);

9. Restriction of rote process to non-logical structures of high utility (such as memorization of alphabetical order).

10. Encouragement of talking in association with concrete experience in social settings to extend, sharpen, and validate pre-concepts; and

11. Extensive use of dramatic play techniques using concrete materials as a source of social skills, knowledge, and academic motivation.

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unitive control techniques (using principles of behavior modification) were fairly well throughout the four schools by the third year, after two years of major stress among arning the reinforcement strategies.

DATA SOURCES

Data reported in this paper were gathered using the instruments described below. other sources of data were employed in connection with special studies. Results of the studies are reported elsewhere.

Social Behavior

Changes in social behavior were measured using the Coping Analysis Schedule for Ed Settings (CASES). All experimental subjects and several selected control groups were o fall and spring in each classroom setting over a period of ten days.

Intellectual Performance

Intelligence test scores were obtained each fall and spring each year in using the Binet Intelligence Scale (Form L-M, 1960 Revision). In addition, selective use was made Picture Vocabulary Test, (PPVT) the Wechsler Preschool and Primary Scale of Intelligenc and the Wechsler Intelligence Scale for Children (WISC). Data given in this report were using the Stanford-Binet and the WISC.

Language Development

Data on language performance were gathered each year from samples of subjects draw experimental and control groups using the Illinois Test of Psycholinguistic Abilities (mental Edition).

Academic Achievement

All children in the ungraded primary classes were administered the Metropolitan Ac (MAT) in the spring of each project year. The MAT was also administed to a number of c for comparison purposes.

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RESULTS

Effects of Experimental Programs on Classroom Behavior

Hypotheses 1 and 2 predict changes in classroom behavior as a function of the treatments.

Hypothesis 1

The effect of the experimental social behavior modification treatments used in the program will be to increase obedient, conforming behavior in teacher-directed classroom settings.

Hypothesis 2

The effect of experimental social behavior modification treatments will be to increase independent, productive, assertive behavior in non-teacher-directed classroom settings (such as seat work and programmed learning situations).

Data relevant to these two hypotheses are given in Figure 1. The percentages (EIP) subjects who reached criterion during their tenure in EIPare shown by the hei bar. The criterion in teacher-directed settings was 80% (or more) of all time-samp classroom behavior falling within categories of the CASES instrument identifying ob tion, and conformity. In non-teacher-directed settings the criterion was 85% (or m samples of observed behavior falling within CASES categories identifying independen assertive behavior.

The shaded bars represent percentages of EIP subjects who fell below criterion tenure in EIP. The changes are largely in the predicted direction and are signific level (χ^2 = 9.80 for teacher-directed settings and χ^2 = 32.01 for non-teacher-dir

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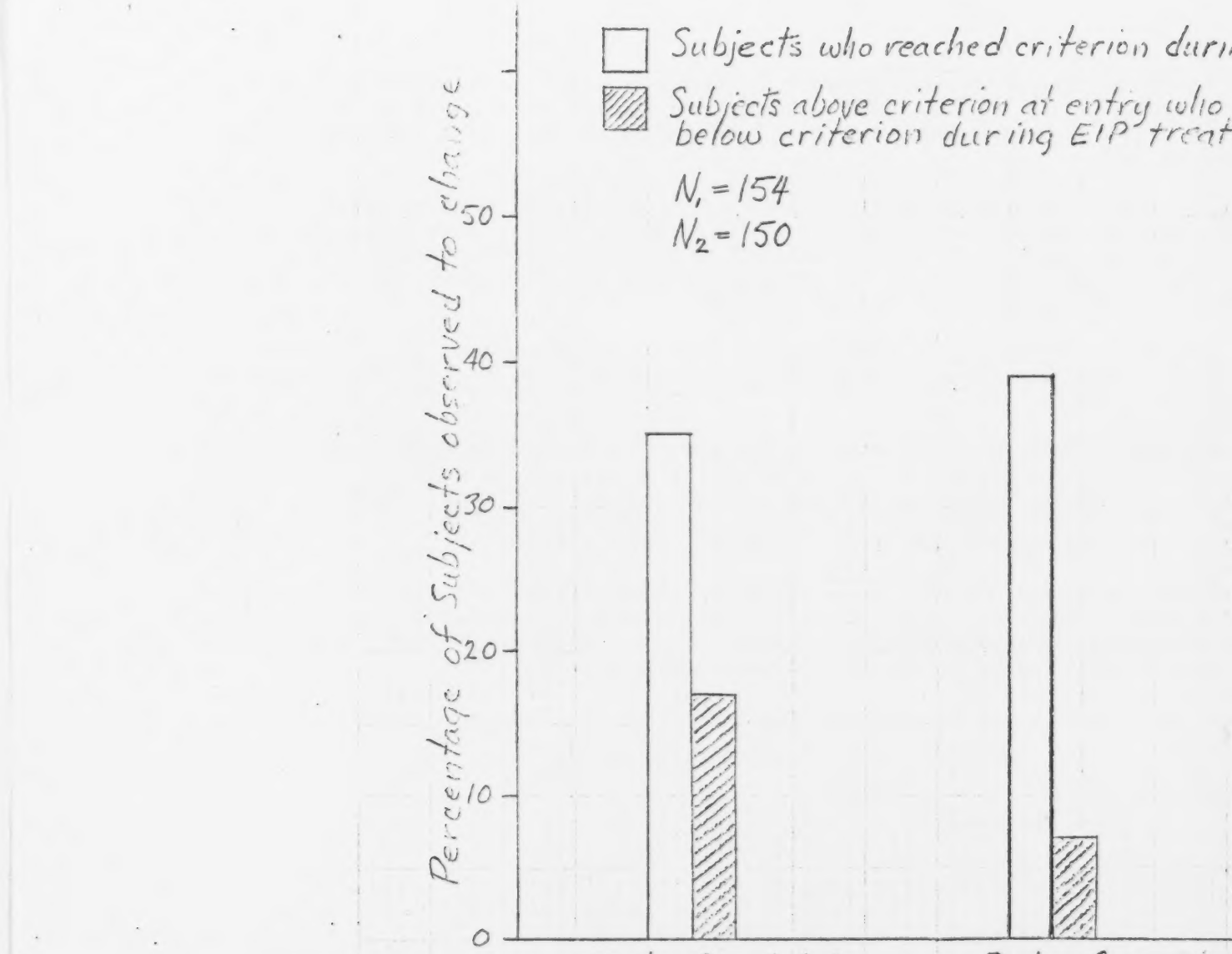
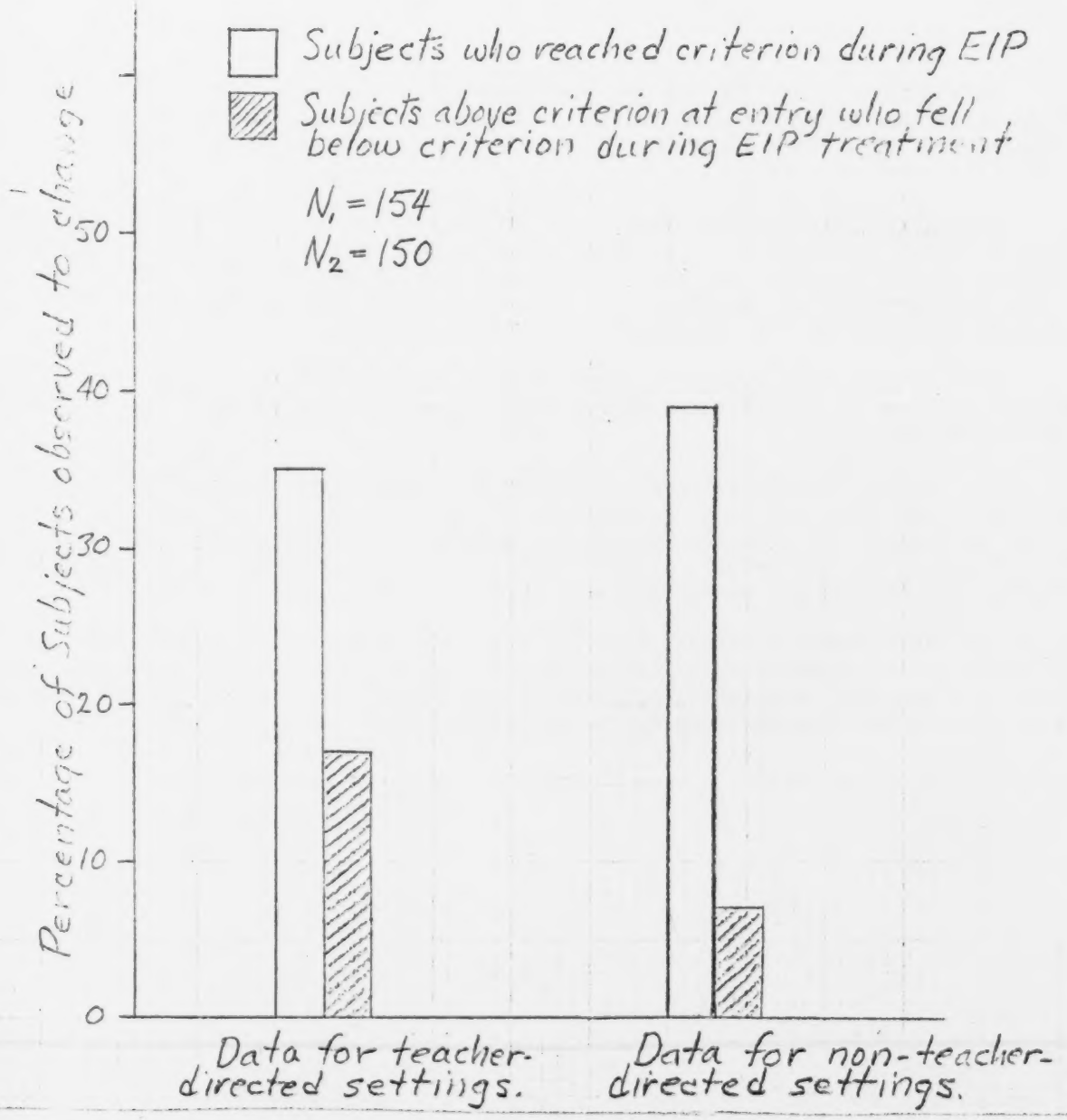


Figure 1. Percentages of EIP subjects who reached criterion and fell below criterio
classroom settings (teacher-directed and non-teacher-directed) during tenure in EIP.



Percentages of EIP subjects who reached criterion and fell below criterion in two types of settings (teacher-directed and non-teacher-directed) during tenure in EIP.

In addition to the 35% who reached criterion in teacher-directed settings, 14% above criterion throughout the program. Thirty-nine percent reached criterion in no directed settings, while 7% dropped below criterion. Another 3% who were above crit were still above at exit.

Hypothesis 5 stated that pupils who participate in the experimental ungraded p more desirable classroom behavior (specifically, more cooperative, docile, conformin teacher-directed settings and more independent-productive, assertive, socially integ in non-teacher-directed settings) than control children who have not experienced the behavior modification and ungraded instructional programs.

Data to test this hypothesis were gathered using CASES in all EIP classes and matched first grade control classes and some Follow-Through classes. The relevant c given in Figure 2.

The results show no difference between the experimental and control subjects i settings. Approximately equal percentages of pupils in both groups reached criterio tenure in school. The results for non-teacher-directed settings are dramatically di Only .7 percent of the control pupils reached criterion while 40% of EIP children re results were significant beyond the .001 level of probability ($\chi^2 = 66.08$).

The experimental programs, expecially the ungraded, individualized instructiona the non-punitive behavior modification procedures were effective in producing indepe assertive, socially integrative behavior in the absence of direct adult supervision. tical results were corroborated by the testimony of many visitors to the project.

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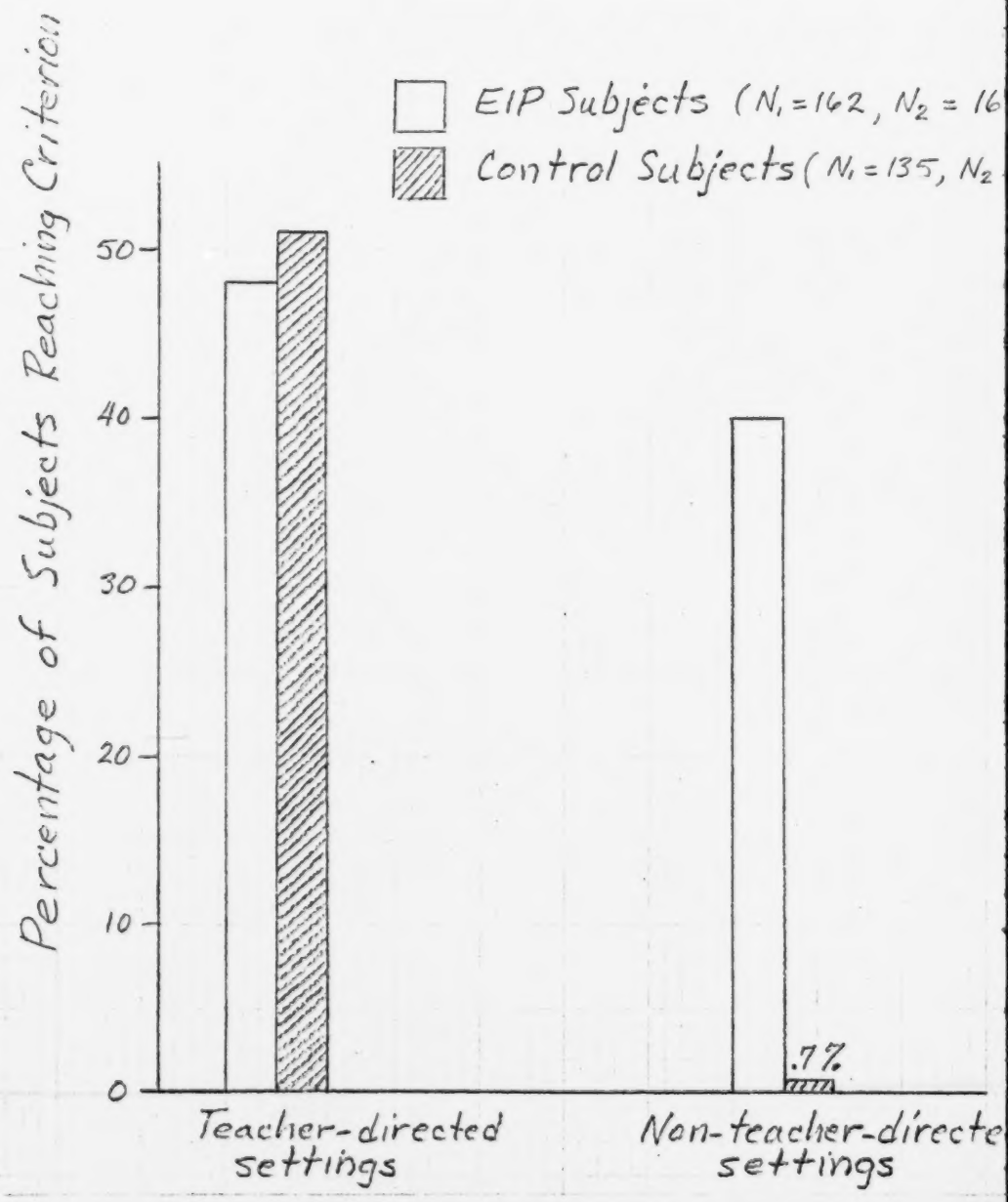
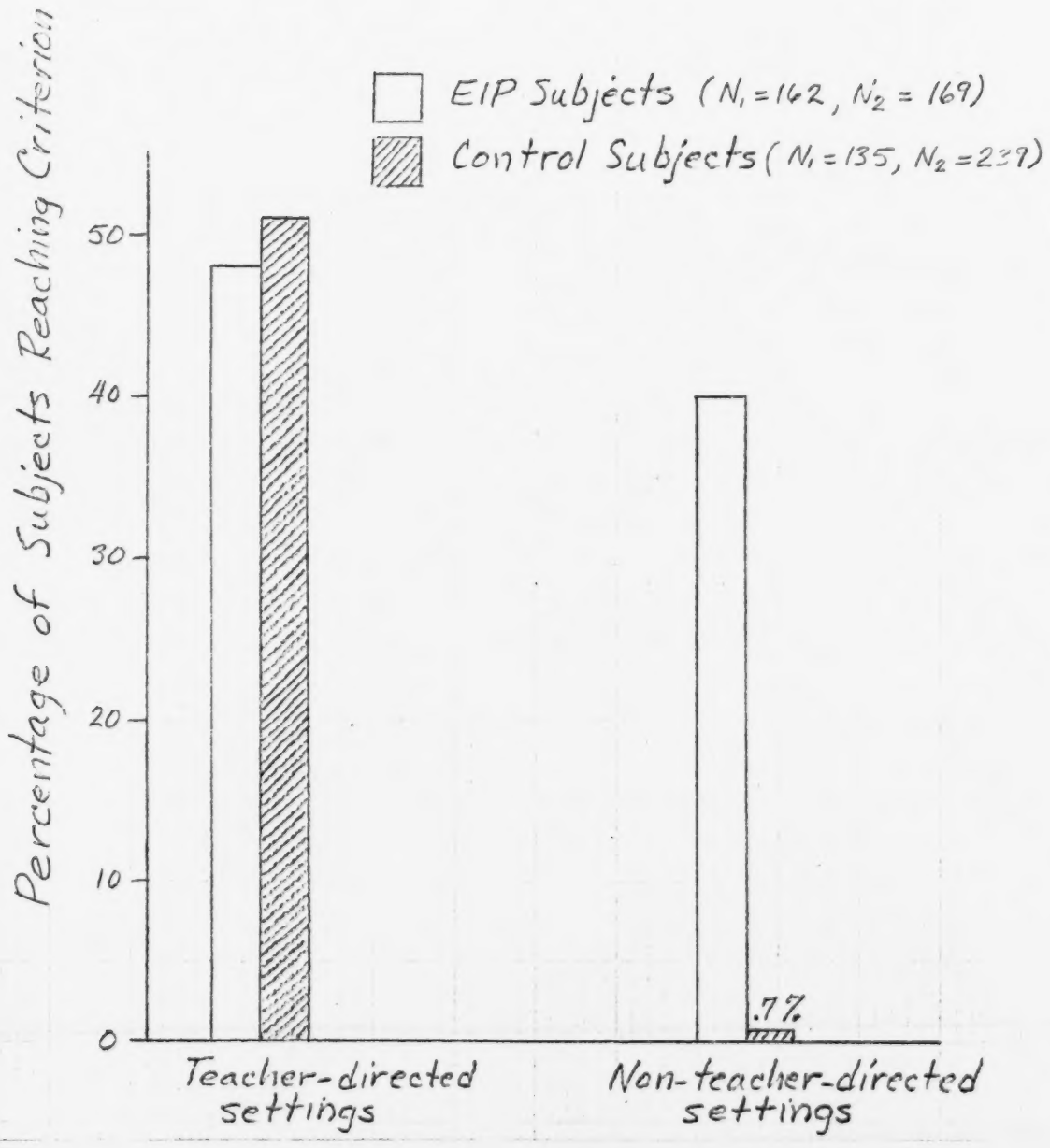


Figure 2. Differences in percentages of subjects reaching criterion during treatment classroom settings (teacher-directed and non-teacher-directed).



Differences in percentages of subjects reaching criterion during treatment in two types of settings (teacher-directed and non-teacher-directed).

Effects of EIP Treatments on Intellectual Development

Three standardized measures were used to assess intellectual development from entry to EIP at about age 2 through age 9 or 10 at the completion of the three-year ungraded program. The main instrument used was the Stanford-Binet Intelligence Scale (Form L-M, 1960 Revision). The Wechsler Preschool and Primary Scale of Intelligence was experimented with to determine if it would correlate with the Wechsler Intelligence Scale for Children as an alternative to the use of the Stanford-Binet. After a period of trial use, reliance on the WPPSI and the WISC was discontinued except in those cases where initial scores on the S-B at entry to EIP classes were not available. Tables 1 through 5 and Figures 3 through 7 present Stanford-Binet I.Q. scores and standard deviations for experimental and control groups by target area. For those years and terms where WPPSI and WISC data were available (and Stanford-Binets had not been administered) S-B mean I.Q.s were estimated by means of regression analysis using relationships between scores on the two tests in question for those subjects who had received both tests at the same chronological age.

Data on intellectual development obtained from the WISC (and to a lesser extent from the WPPSI) were apparently subject to practice effects. An item analysis of the responses of a sample of children who had been administered both the S-B and the WISC several times over a two- or three-year period suggested that the subjects were remembering questions from prior administrations of the WISC. The S-B appeared to be less subject to practice effects (due to the fact that items are changed in the pattern of S-B administration) and it became the preferred measure used in tracing intellectual development during EIP treatment periods.

Full Scale I.Q.s obtained using the WISC are presented in Tables 6 and 7 and Figures 8 and 9.

Table

Stanford-Binet (Form L-M) Mea
for Target Area A for

Group	Project Year	Date of Admin.	N
011a	1	S 66	4
	2	S 67	3
	3	F 67	4
		S 68	4
	4	F 68	4
		S 69	4
	5	S 70	4
011c	3	F 67	6
		S 68	6
	4	F 68	6
		S 69	6
	5	S 70	6
011d	4	F 68	2
	5	S 70	2
012a	2	S 67	12
	3	F 67	12
		S 68	12
	4	F 68	12
		S 69	12
	5	F 69	12
		S 70	12
012c	4	F 68	9
		S 69	9
	5	F 69	9
		S 70	9
013a	4	F 68	7
		S 69	7

[a]Stanford-Binet I.Q. and M.A. e
appropriate chronological ages, usin
Verbal) - (.2407 x CA) + constant of
on an analysis of 47 sets of WPPSI a
WPPSI Performance scores, sex, race,
Verbal and C.A. were employed none o
nificant variance.

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sts in question for those subjects who had received
nological age.
evelopment obtained from the WISC (and to a lesser
apparently subject to practice effects. An item
f a sample of children who had been administered both
ni times over a two- or three-year period suggested
mbering questions from prior administrations of the
be less subject to practice effects (due to the fact
he pattern of S-B administration) and it became the
racing intellectual development during EIP treatment

ned using the WISC are presented in Tables
3 and 9.

Table 1

Stanford-Binet (Form L-M) Means and Standard Deviations for Target Area A for 1966 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
011a	1	S 66	4	38.8	3.4	91.5	8.2
	2	S 67	3	46.0	5.3	101.3	6.7
	3	F 67	4	54.3		92.4[a]	
		S 68	4	60.8		95.5[a]	
	4	F 68	4	65.8		95.8[a]	
		S 69	4	71.8	3.8	93.3	8.5
	5	S 70	4	84.8	4.6	93.8	11.7
011c	3	F 67	6	53.0		90.7[a]	
		S 68	6	58.2		88.2[a]	
	4	F 68	6	63.8		90.9[a]	
		S 69	6	69.8	4.3	87.3	8.0
	5	S 70	6	82.8	4.4	85.0	12.2
011d	4	F 68	2	72.0	0.0	100.0	4.2
	5	S 70	2	84.5	2.1	86.0	
012a	2	S 67	12	59.5	3.7	94.3	
	3	F 67	12	66.5		91.9[a]	
		S 68	12	72.9		89.2[a]	
	4	F 68	12	78.6	3.5	94.4	15.0
		S 69	12	83.3	3.8	97.6	17.0
	5	F 69	12	89.5	3.6	95.3	14.4
		S 70	12	95.2	3.9	95.5	12.6
012c	4	F 68	9	78.7	4.4	96.6	11.2
		S 69	9	83.1	4.3	95.7	11.5
	5	F 69	9	89.4	4.2	94.8	14.3
		S 70	9	95.0	4.5	102.1	11.7
013a	4	F 68	7	41.9	2.5	89.9	12.0
		S 69	7	47.7	2.4	96.6	10.3

[a]Stanford-Binet I.Q. and M.A. estimated from WPPSI Verbal I.Q. scores appropriate chronological ages, using the formula: SB = (.6459 x WPPSI Verbal) - (.2407 x CA) + constant of 52.01. The equation used was based on an analysis of 47 sets of WPPSI and S-B scores using WPPSI Verbal scores WPPSI Performance scores, sex, race, and CA as predictors. After WPPSI Verbal and C.A. were employed none of the other variables contributed significant variance.

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Table 1 (continued) - Stanford-Binet (Form L-M) Means and Standard Deviations for Target Area A for 1966 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
013a	5	F 69	7	53.7	2.6	94.0	9.5
		S 70	7	59.6	3.2	96.7	6.6
111	2	S 67	6	46.4	2.7	80.5	7.8
	5	S 70	5	86.8	3.3	83.6	7.1
112	2	S 67	8	58.3	3.8	75.9	9.4
	4	S 69	7	82.6	4.1	85.6	10.4
	5	S 70	8	95.8	3.5	82.1	12.3
121	2	S 67	4	36.2	4.7	101.0	8.5
	5	S 70	5	78.0	2.5	88.2	6.7
911	5	S 70	10	81.3	4.3	85.0	8.2
912	5	S 70	12	95.7	9.5	98.1	13.1

Standard Legend Used on All Figures

Sex Code

△ Boys

○ Girls

□ Boys and Girls

Group Code

▲ ● ■ Black

△ ○ □ White

◭ ◑ ◪ Black and White

▲——▲ Experimental Groups, First digit 0

▲----▲ Control Groups, First digit 1-9

Alphameric Code for Group Identification

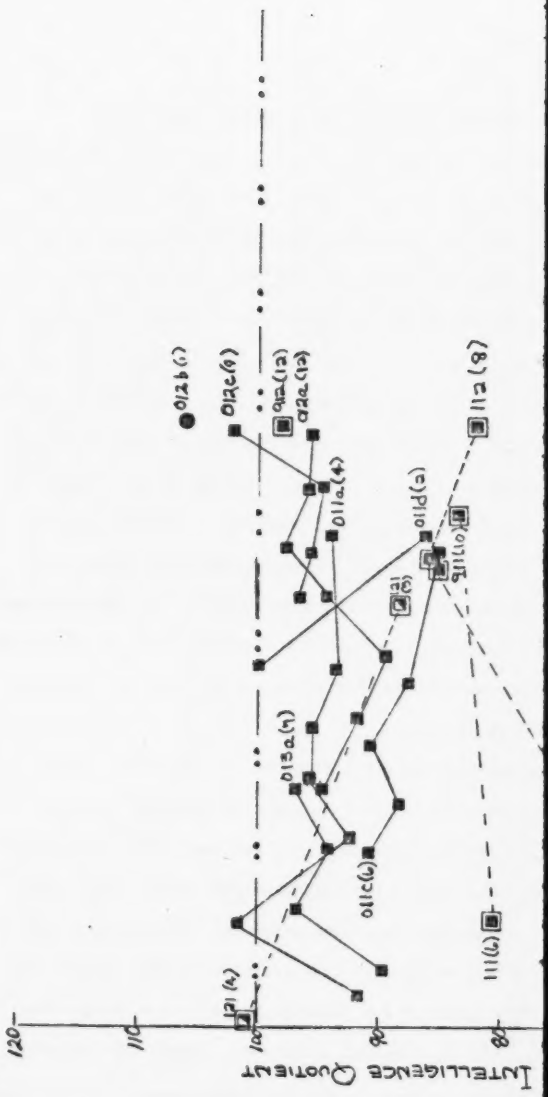
Example:

031a (17) = Experimental group 031a with an N of 17

Norm for tests: ——.——.——

Exit point from EIP (where applicable) = E

Data on "graduates" from EIP (where applicable) = G



ord-Binet (Form L-M) Means and
t Area A for 1966 through 1970

N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
7	53.7	2.6	94.0	9.5
7	59.6	3.2	96.7	6.6
6	46.4	2.7	80.5	7.8
5	86.8	3.3	83.6	7.1
8	58.3	3.8	75.9	9.4
7	82.6	4.1	85.6	10.4
8	95.8	3.5	82.1	12.3
4	36.2	4.7	101.0	8.5
5	78.0	2.5	88.2	6.7
10	81.3	4.3	85.0	8.2
12	95.7	9.5	98.1	13.1

end Used on All Figures

oys

irls

oys and Girls

lack

hite

lack and White

xperimental Groups, First digit 0

ontrol Groups, First digit 1-9

Code for Group Identification

e:

31a (17) = Experimental group 031a
with an N of 17

nts: ——.——.——

from EIP (where applicable) = E

raduates" from EIP (where applicable) = G

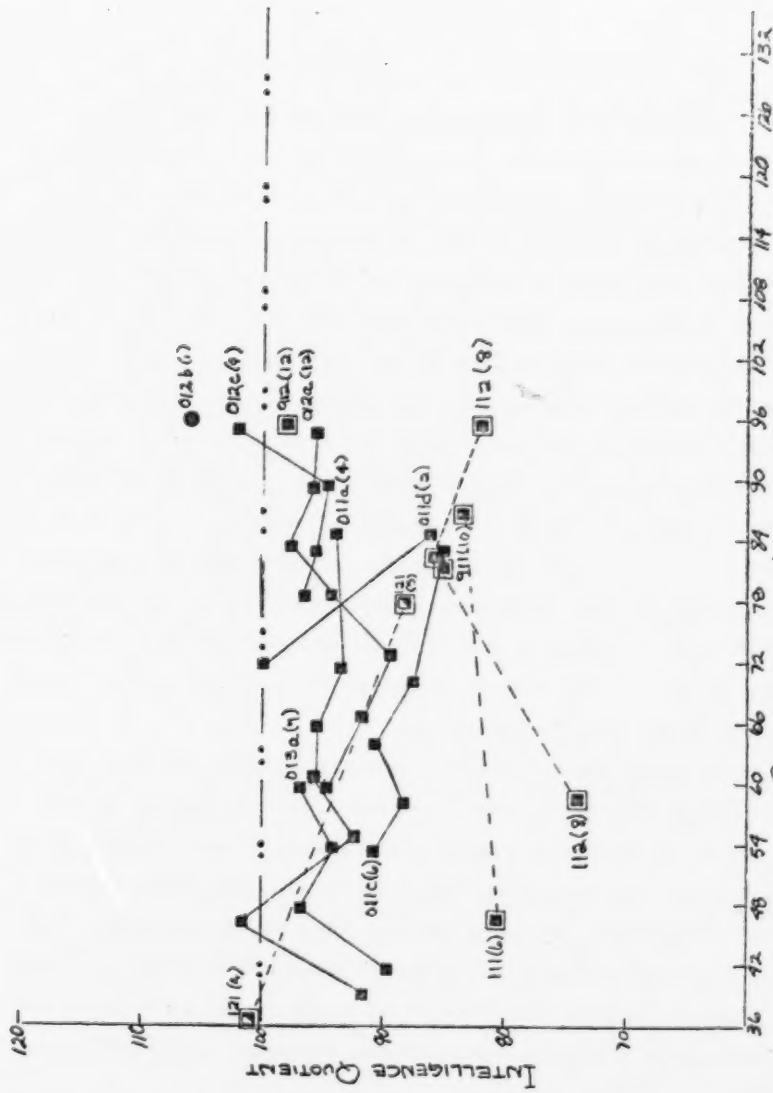


Fig. 3 Stanford-Binet Intelligence Quotient for all experimental and control groups in Target Area A.

Table 2

Stanford-Binet (Form L-M) Means and Standard Deviations for Target Area B for 1966 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
021a	2	F 66	7	29.3	2.0	106.4	13.3
		S 67	10	35.8	5.3	97.5	13.9
	3	F 67	8	38.9	2.0	99.6	9.0
		S 68	8	45.3	1.8	109.5	9.3
	4	F 68	10	53.0		99.8[a]	
		S 69	10	59.8	5.2	99.0	10.0
	5	F 69	10	65.5	5.1	98.4	9.2
		S 70	10	70.6	4.9	102.6	13.1
021b	3	F 67	3	43.0	3.5	88.0	6.9
	4	F 68	3	53.0		95.9[a]	
		S 69	3	60.0	5.2	98.0	7.8
	5	F 69	3	65.7	4.6	90.0	5.3
		S 70	3	72.0	3.5	95.7	10.6
021c	4	F 68	3	55.0		89.0[a]	
		S 69	3	61.7	1.5	99.7	7.6
	5	F 69	3	67.0	2.0	89.0	12.5
		S 70	3	74.0	2.0	90.7	16.2
022a	2	S 67	7	71.1	2.9	88.1	7.8
	3	F 67	7	78.3		95.0[b]	
		S 68	2	81.5	2.1	95.5	17.7

[a]Stanford-Binet I.Q. and M.A. estimated from WPPSI Verbal I.Q. scores at appropriate chronological ages, using the formula: SB = (.6459 x WPPSI Verbal) - (.2407 x CA) + constant of 52.01. The equation used was based on an analysis of 47 sets of WPPSI and S-B scores using WPPSI Verbal scores, WPPSI Performance scores, sex, race, and CA as predictors. After WPPSI Verbal and C.A. were employed none of the other variables contributed significant variance.

[b]Stanford-Binet I.Q. and M.A. estimated from WISC Verbal and Performance I.Q. scores at appropriate chronological ages, using the following formulas:

Black: SB = (.5137 x WISC Verbal) + (.3038 x WISC Performance) + (4.9701) - (.2560 x CA) + 32.2413

White: SB = (.5137 x WISC Verbal) + .3038 x WISC Performance) - (.2560 x CA) + 32.2413

Boys, Girls, All: SB = (.5886 x WISC Verbal) + (.2417 x WISC Performance) - (.2373 x CA) + 33.0932

The equations used were based on analysis of 115 sets of WISC and S-B scores using WISC Verbal scores, WISC Performance scores, sex, race, and CA as predictors. After WISC Verbal, Performance, CA and race were employed, sex contributed no significant variance.

Table 2 (continued) - Stanford-Bine
Standard Deviations for Target Area

Group	Project Year	Date of Admin.	N
022a	4	F 68	7
		S 69	7
	5	F 69	7
		S 70	7
022b	3	S 68	7
	4	F 68	7
		S 69	7
	5	F 69	7
121	2	S 67	4
	5	S 70	5
122	2	S 67	5
	5	S 70	4
141	5	S 70	18
142	5	S 70	20
921	5	S 70	7
922	5	S 70	11

Table 2

L-M) Means and Standard Deviations
Area B for 1966 through 1970

	C.A.		I.Q.	
N	Mn.	S.D.	Mn.	S.D.
7	29.3	2.0	106.4	13.3
10	35.8	5.3	97.5	13.9
8	38.9	2.0	99.6	9.0
8	45.3	1.8	109.5	9.3
10	53.0		99.8[a]	
10	59.8	5.2	99.0	10.0
10	65.5	5.1	98.4	9.2
10	70.6	4.9	102.6	13.1
3	43.0	3.5	88.0	6.9
3	53.0		95.9[a]	
3	60.0	5.2	98.0	7.8
3	65.7	4.6	90.0	5.3
3	72.0	3.5	95.7	10.6
3	55.0		89.0[a]	
3	61.7	1.5	99.7	7.6
3	67.0	2.0	89.0	12.5
3	74.0	2.0	90.7	16.2
7	71.1	2.9	88.1	7.8
7	78.3		95.0[b]	
2	81.5	2.1	95.5	17.7

and M.A. estimated from WPPSI Verbal I.Q. scores
cal ages, using the formula: SB = (.6459 x WPPSI
constant of 52.01. The equation used was based
of WPPSI and S-B scores using WPPSI Verbal scores,
sex, race, and CA as predictors. After WPPSI
oyed none of the other variables contributed sig-

and M.A. estimated from WISC Verbal and Performance
chronological ages, using the following formulas:
137 x WISC Verbal) + (.3038 x WISC Performance) +
.9701) - (.2560 x CA) + 32.2413
137 x WISC Verbal) + .3038 x WISC Performance) -
560 x CA) + 32.2413
386 x WISC Verbal) + (.2417 x WISC Performance) -
273 x CA) + 33.0932
ased on analysis of 115 sets of WISC and S-B scores
WISC Performance scores, sex, race, and CA as
rbal, Performance, CA and race were employed,
icant variance.

Table 2 (continued) - Stanford-Binet (Form L-M) Means and Standard Deviations for Target Area B for 1966 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
022a	4	F 68	7	90.4	2.6	90.1	10.0
		S 69	7	94.9	3.0	93.1	8.0
	5	F 69	7	101.1	2.9	93.6	9.0
		S 70	7	107.3	3.0	93.4	7.0
022b	3	S 68	7	82.8	5.0	81.5	7.3
	4	F 68	7	91.0	4.6	82.1	6.8
		S 69	7	94.6		80.9[b]	
	5	F 69	7	100.1		78.9[b]	
121	2	S 67	4	36.2	4.7	101.0	8.5
	5	S 70	5	78.0	2.5	88.2	6.7
122	2	S 67	5	71.2	5.2	81.4	13.8
	5	S 70	4	107.5	5.5	88.8	8.5
141	5	S 70	18	127.6	11.5	83.3	12.4
142	5	S 70	20	109.8	7.6	91.2	14.1
921	5	S 70	7	74.7	4.8	93.0	9.6
922	5	S 70	11	105.5	5.8	90.0	18.7

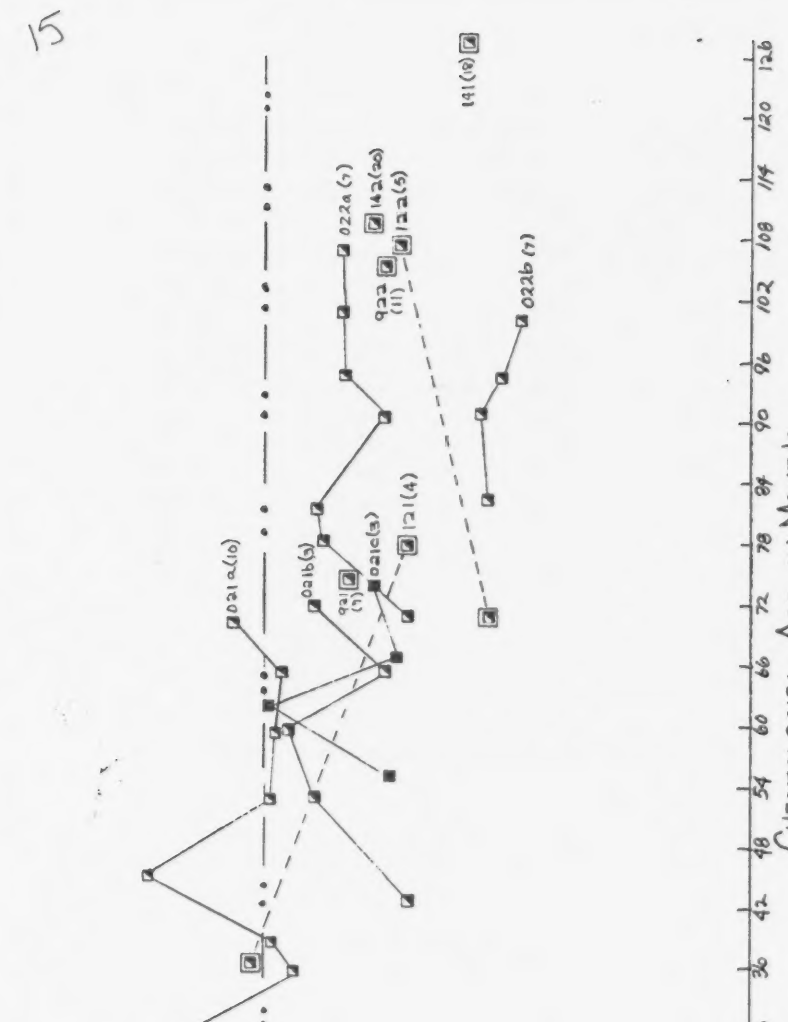


Fig. 4 Stanford-Binet Intelligence Quotient for all experimental and control groups in Target Area B.

Table 3

Stanford-Binet (Form L-M) Means and St
for Target Area C for 1965 thr

Group	Project Year	Date of Admin.	N	C.A Mn.
031a	1	F 65	17	66.6
		S 66	17	73.6
	2	F 66	17	79.1
		S 67	17	84.7
	3	F 67	17	89.2
		S 68	6	95.8
	4	F 68	17	101.3
		S 69	16	107.5
	5	S 70	16	120.5
031b	3	S 68	4	92.3
	4	F 68	4	97.8
		S 69	4	103.5
032a	2	S 67	12	47.2
	3	F 67	12	53.7
		S 68	12	59.4
	4	F 68	12	65.1
		S 69	12	71.2
	5	F 69	12	77.5
		S 70	12	83.5

[a]Stanford-Binet I.Q. and M.A. estimated
at appropriate chronological ages, using the
Verbal) - (.2407 x CA) + constant of 52.01.
on an analysis of 47 sets of WPPSI and S-B sc
WPPSI Performance scores, sex, race, and CA a
Verbal and C.A. were employed none of the oth
nificant variance.

[b]Stanford-Binet I.Q. and M.A. estimated
I.Q. scores at appropriate chronological ages
Black SB = (.5137 x WISC Verbal) +
(4.9701) - (.2560 x CA)
White SB = (.5137 x WISC Verbal) +
(.2560 x CA) + 32.2413
Boys, Girls, All SB = (.5886 x WISC Verbal) +
(.2373 x CA) + 33.0932
The equations used were based on analysis of
using WISC Verbal scores, WISC Performance sc
predictors. After WISC Verbal, Performance, C
sex contributed no significant variance.

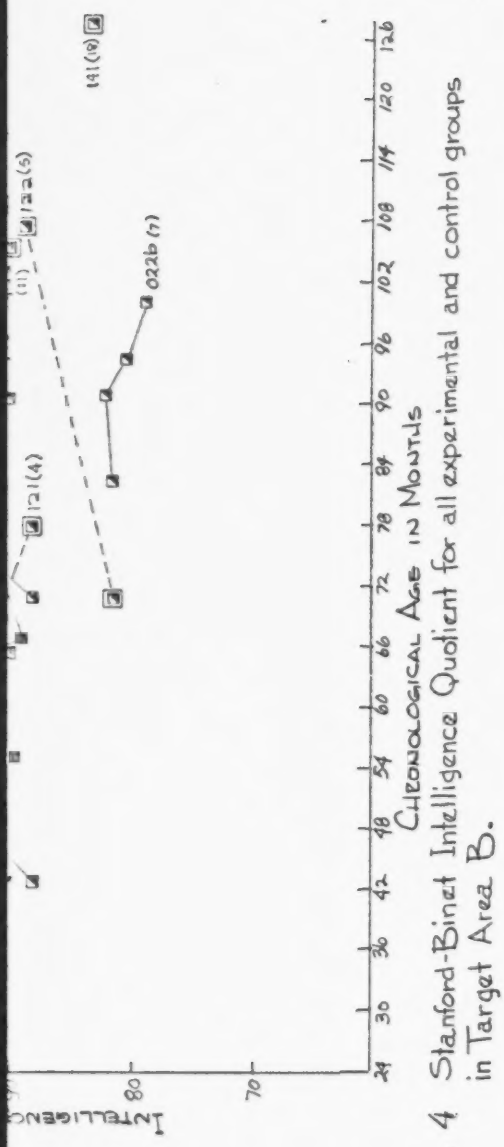


Fig. 4 Stanford-Binet Intelligence Quotient for all experimental and control groups in Target Area B.

Table 3

Stanford-Binet (Form L-M) Means and Standard Deviations for Target Area C for 1965 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
031a	1	F 65	17	66.6	3.5	90.4	11.4
		S 66	17	73.6	3.3	92.9	11.6
	2	F 66	17	79.1		94.8[b]	
		S 67	17	84.7		89.1[b]	
	3	F 67	17	89.2		95.4[b]	
		S 68	6	95.8	4.3	95.7	9.1
	4	F 68	17	101.3		91.7[b]	
		S 69	16	107.5	3.4	92.7	8.6
	5	S 70	16	120.5	3.7	97.8	8.9
031b	3	S 68	4	92.3	1.5	111.7	27.4
	4	F 68	4	97.8		99.5[b]	
		S 69	4	103.5		104.2[b]	
032a	2	S 67	12	47.2	2.9	99.6	11.6
	3	F 67	12	53.7		97.9[a]	
		S 68	12	59.4		97.7[a]	
	4	F 68	12	65.1		96.3[a]	
		S 69	12	71.2	3.1	98.4	12.4
	5	F 69	12	77.5	2.9	99.9	12.9
		S 70	12	83.5	3.7	103.8	11.4

[a]Stanford-Binet I.Q. and M.A. estimated from WPPSI Verbal I.Q. scores at appropriate chronological ages, using the formula: SB = (.6459 x WPPSI Verbal) - (.2407 x CA) + constant of 52.01. The equation used was based on an analysis of 47 sets of WPPSI and S-B scores using WPPSI Verbal scores, WPPSI Performance scores, sex, race, and CA as predictors. After WPPSI Verbal and C.A. were employed none of the other variables contributed significant variance.

[b]Stanford-Binet I.Q. and M.A. estimated from WISC Verbal and Performance I.Q. scores at appropriate chronological ages, using the following formulas:

Black: SB = (.5137 x WISC Verbal) + (.3038 x WISC Performance) + (4.9701) - (.2560 x CA) + 32.2413

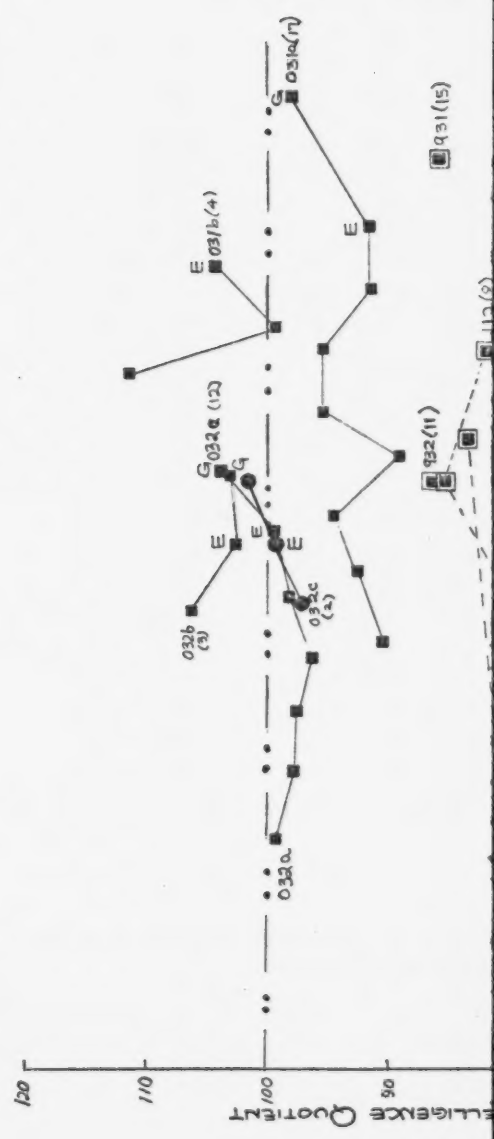
White: SB = (.5137 x WISC Verbal) + .3038 x WISC Performance) - (.2560 x CA) + 32.2413

Boys, Girls, All: SB = (.5886 x WISC Verbal) + (.2417 x WISC Performance) - (.2373 x CA) + 33.0932

The equations used were based on analysis of 115 sets of WISC and S-B scores using WISC Verbal scores, WISC Performance scores, sex, race, and CA as predictors. After WISC Verbal, Performance, CA and race were employed, sex contributed no significant variance.

Table 3 (continued) - Stanford-Binet (Form L-M) Means and Standard Deviations for Target Area C for 1965 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
032b	4	S 69	3	69.7	4.2	106.7	5.7
	5	F 69	3	76.3	4.0	102.3	12.2
		S 70	3	82.7	4.5	102.7	11.4
032c	4	S 69	2	70.5	2.1	97.5	17.7
	5	F 69	2	76.5	2.1	99.5	21.9
		S 70	2	82.5	2.1	101.5	24.7
111	2	S 67	6	46.4	2.7	80.5	7.8
	5	S 70	5	86.8	3.3	83.6	7.1
112	2	S 67	8	58.3	3.8	73.9	9.4
	4	S 69	7	82.6	4.1	85.6	10.4
	5	S 70	8	95.8	3.5	82.1	12.3
931	5	S 70	15	114.4	8.3	86.1	9.6
932	5	S 70	11	82.8	6.2	86.4	9.1



-Binet (Form L-M) Means and
Area C for 1965 through 1970

C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
69.7	4.2	106.7	5.7
76.3	4.0	102.3	12.2
82.7	4.5	102.7	11.4
70.5	2.1	97.5	17.7
76.5	2.1	99.5	21.9
82.5	2.1	101.5	24.7
46.4	2.7	80.5	7.8
86.8	3.3	83.6	7.1
58.3	3.8	73.9	9.4
82.6	4.1	85.6	10.4
95.8	3.5	82.1	12.3
114.4	8.3	86.1	9.6
82.8	6.2	86.4	9.1

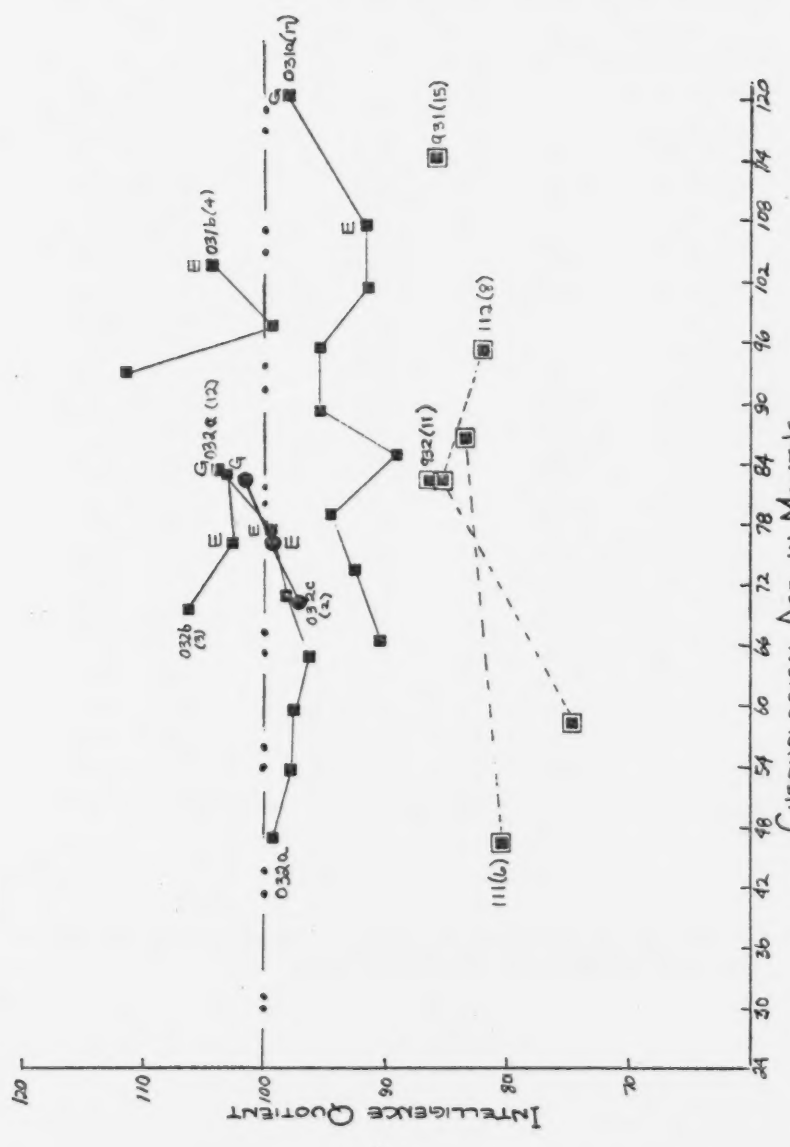


Fig. 5 Stanford-Binet Intelligence Quotients for all experimental and control groups in Target Area C.

17

Table 4

Stanford-Binet (Form L-M) Means and Standard Deviations for Target Area D for 1965 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
041a	1	F 65	7	66.7	3.5	90.9	11.5
		S 66	7	73.0	3.8	94.3	9.0
	2	F 66	7	78.9		86.5[a]	
		S 67	7	84.7		95.6[a]	
	3	F 67	7	89.7		92.0[a]	
		S 68	7	95.4		91.0[a]	
	4	F 68	7	100.9		89.1[a]	
		S 69	7	106.7	3.7	90.1	11.2
	5	S 70	6	120.5	3.2	90.2	12.9
042a	2	S 67	4	71.3	3.5	92.3	16.9
	3	F 67	4	81.6		88.7[a]	
		S 68	4	86.8		92.6[a]	
	4	F 68	4	92.8		89.4[a]	
		S 69	4	95.3	3.5	85.0	11.8
	5	F 69	4	102.5	3.9	89.8	11.3
		S 70	4	107.0	3.9	89.0	13.2
44a	4	F 68	11	77.2	3.7	91.4	8.0
		S 69	11	82.2	3.7	90.7	7.9
	5	F 69	11	88.5	3.8	89.4	9.1
		S 70	11	95.1	3.8	90.1	10.5
044b	4	F 68	2	74.0	1.4	99.0	29.7
		S 69	2	78.5	2.1	112.0	32.5
	5	F 69	2	85.0	1.4	107.0	25.5
		S 70	2	90.5	2.1	106.5	27.6
	5	S 70	4	107.5	5.4	88.8	8.5
141	5	S 70	18	127.6	11.5	83.3	12.4
142	5	S 70	20	109.8	7.6	91.2	14.1

[a]Stanford-Binet I.Q. and M.A. estimated from WISC Verbal and Performa I.Q. scores at appropriate chronological ages.

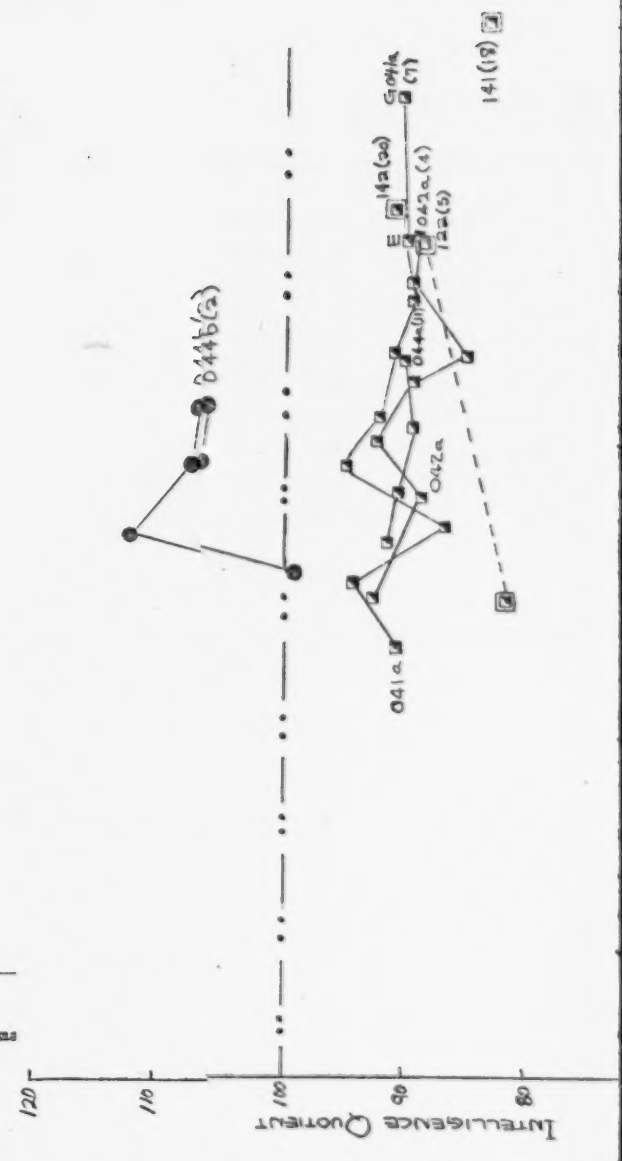


Table 4

L-M) Means and Standard Deviations
ea D for 1965 through 1970

N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
7	66.7	3.5	90.9	11.5
7	73.0	3.8	94.3	9.0
7	78.9		86.5[a]	
7	84.7		95.6[a]	
7	89.7		92.0[a]	
7	95.4		91.0[a]	
7	100.9		89.1[a]	
7	106.7	3.7	90.1	11.2
6	120.5	3.2	90.2	12.9
4	71.3	3.5	92.3	16.9
4	81.6		88.7[a]	
4	86.8		92.6[a]	
4	92.8		89.4[a]	
4	95.3	3.5	85.0	11.8
4	102.5	3.9	89.8	11.3
4	107.0	3.9	89.0	13.2
11	77.2	3.7	91.4	8.0
11	82.2	3.7	90.7	7.9
11	88.5	3.8	89.4	9.1
11	95.1	3.8	90.1	10.5
2	74.0	1.4	99.0	29.7
2	78.5	2.1	112.0	32.5
2	85.0	1.4	107.0	25.5
2	90.5	2.1	106.5	27.6
4	107.5	5.4	88.8	8.5
18	127.6	11.5	83.3	12.4
20	109.8	7.6	91.2	14.1

and M.A. estimated from WISC Verbal and Performa
chronological ages.

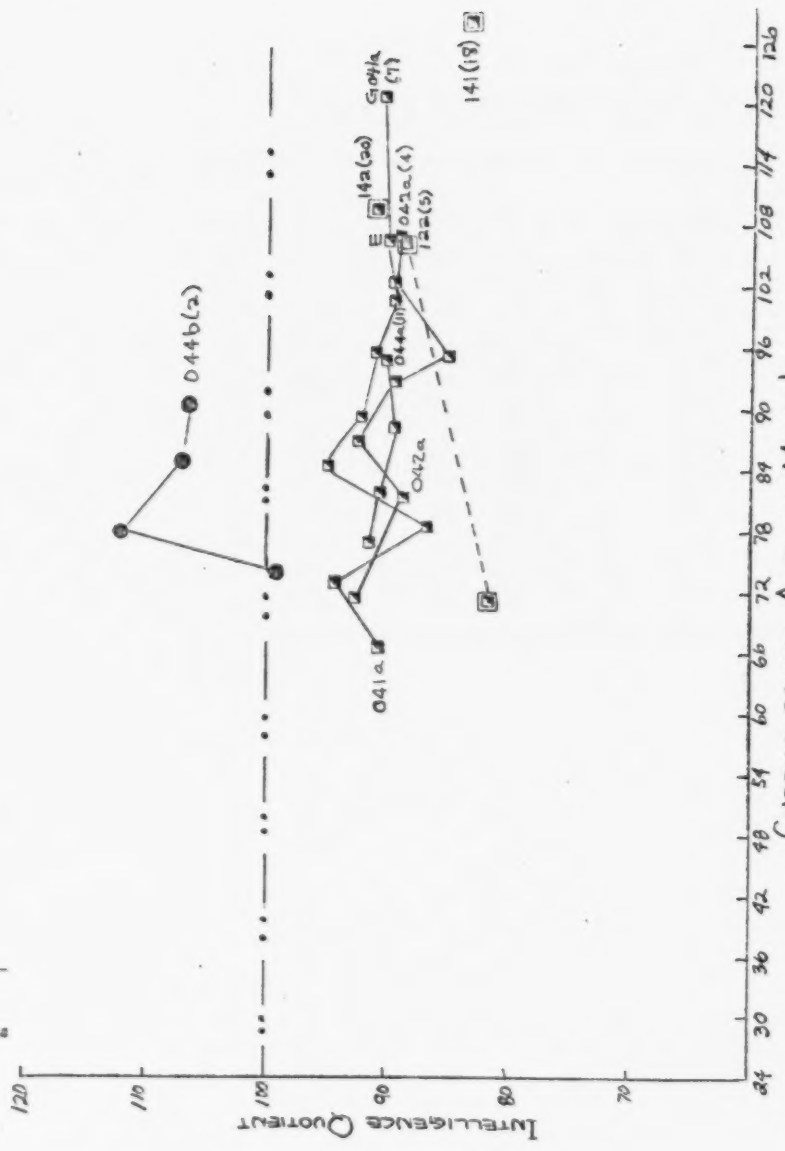


Fig. 6 Stanford-Binet Intelligence Quotient for all experimental and control groups in Target Area D.

Table 5

Stanford-Binet (Form L-M) Means and Standard Deviations
for Infant Project Children for 1968 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	I.Q. Mn.	I.Q. S.D.
051a	3	S 68	7	33.0	1.2	97.6	10.0
	4	S 69	7	42.9	0.9	110.7	11.0
	5	S 70	7	54.0	1.0	108.6	13.9
051b	3	S 68	15	30.9	1.2	90.2	8.1
	4	S 69	15	42.1	1.2	99.1	12.6
	5	S 70	15	51.4	1.2	102.1	13.4
051c	3	S 68	4	33.2	0.3	88.5	7.8
	4	S 69	4	43.5	1.0	90.5	2.9
	5	S 70	5	55.8	1.1	87.4	9.7

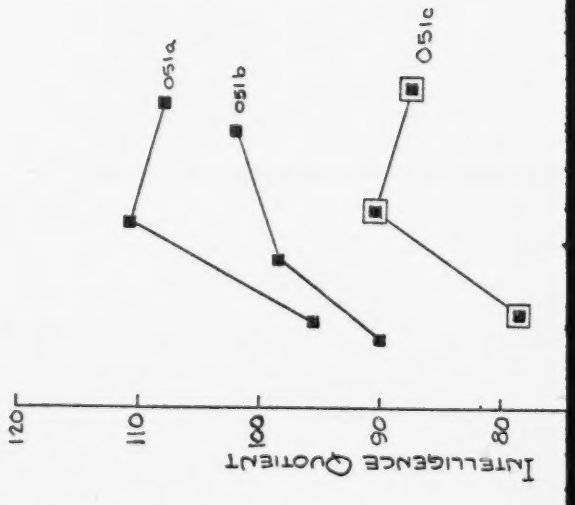


Table 5

L-M) Means and Standard Deviations
ject Children for 1968 through 1970

	C.A.		I.Q.	
N	Mn.	S.D.	Mn.	S.D.
7	33.0	1.2	97.6	10.0
7	42.9	0.9	110.7	11.0
7	54.0	1.0	108.6	13.9
15	30.9	1.2	90.2	8.1
15	42.1	1.2	99.1	12.6
15	51.4	1.2	102.1	13.4
4	33.2	0.3	88.5	7.8
4	43.5	1.0	90.5	2.9
5	55.8	1.1	87.4	9.7

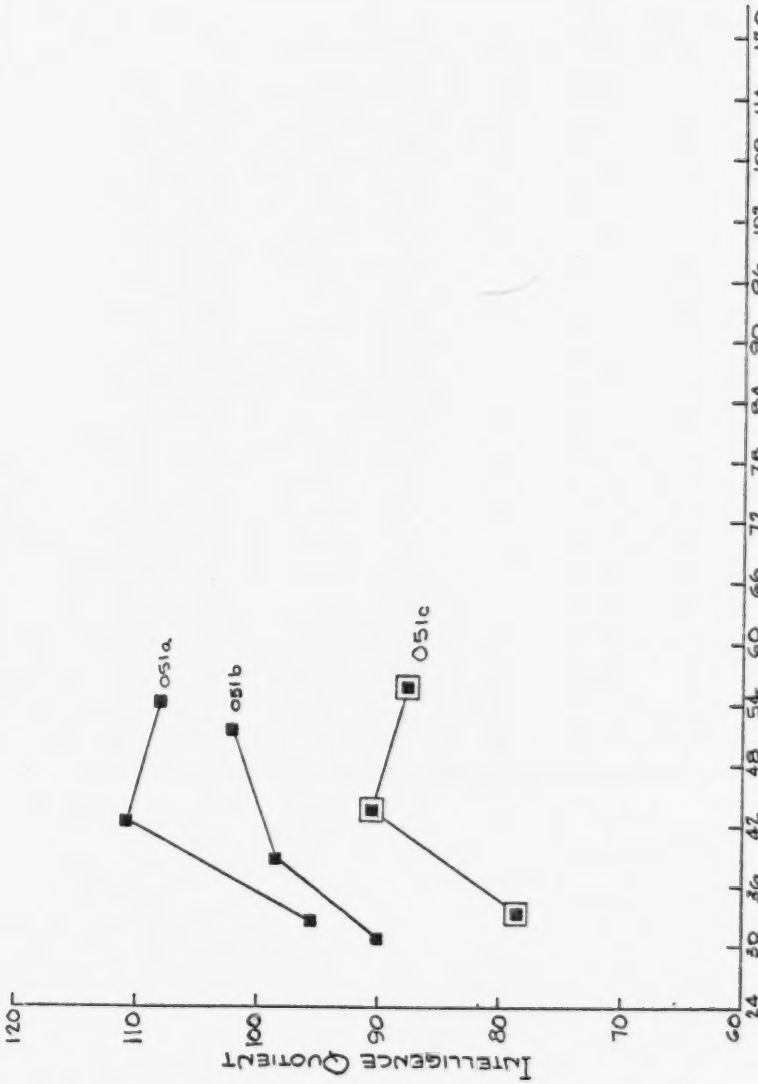


Fig. 7 Stanford-Binet Intelligence Quotient for all experimental and control groups in the Infant Project.

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Table 6

Wechsler Intelligence Scale for Children
Means and Standard Deviations for Target Area C
for 1966 through 1970

Group	project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	FIQ Mn.	FIQ S.D.
031a	2	F 66	17	79.2	3.4	93.3	11.9
		S 67	17	84.7	3.2	98.8	13.4
	3	F 67	16	89.3	3 6	98.9	10.3
		S 68	16	96.2	3.5	102.2	13.8
	4	F 68	17	101.4	3.4	98.1	11.6
		S 69	17	107.0	3.4	104.8	14.7
	5	S 70	17	119.9	3.6	102.2	11.7
031b	2	F 66	4	75.5	1.3	98.5	16.3
		S 67	4	81.5	1.3	110.8	14.8
	3	F 67	4	85.5	1.3	110.5	17.6
		S 68	4	92.5	1.3	113.5	22.6
	4	F 68	4	97.8	1.3	110.0	22.6
		S 69	4	103.5	1.3	118.5	19.5
	5	S 70	4	116.8	1.7	119.0	23.2
031c	3	F 67	2	80.0	0.0	101.5	9.2
		S 68	2	87.0	0.0	103.0	17.0
	4	F 68	2	92.5	0.7	106.0	19.8
		S 69	2	98.0	0.0	108.0	18.4
	5	S 70	2	111.0	0.0	101.5	20.5
131	2	S 67	12	81.5	5.2	87.0	10.4
	4	S 69	9	106.9	5.7	88.7	7.3
	5	S 70	12	120.1	4.8	92.2	12.3
312	4	F 68	34	78.3	3.6	92.3	12.4
		S 69	34	83.4	3.6	93.2	13.1
	5	F 69	33	89.0	3.6	95.0	13.5
		S 70	33	95.3	3.8	96.8	12.5

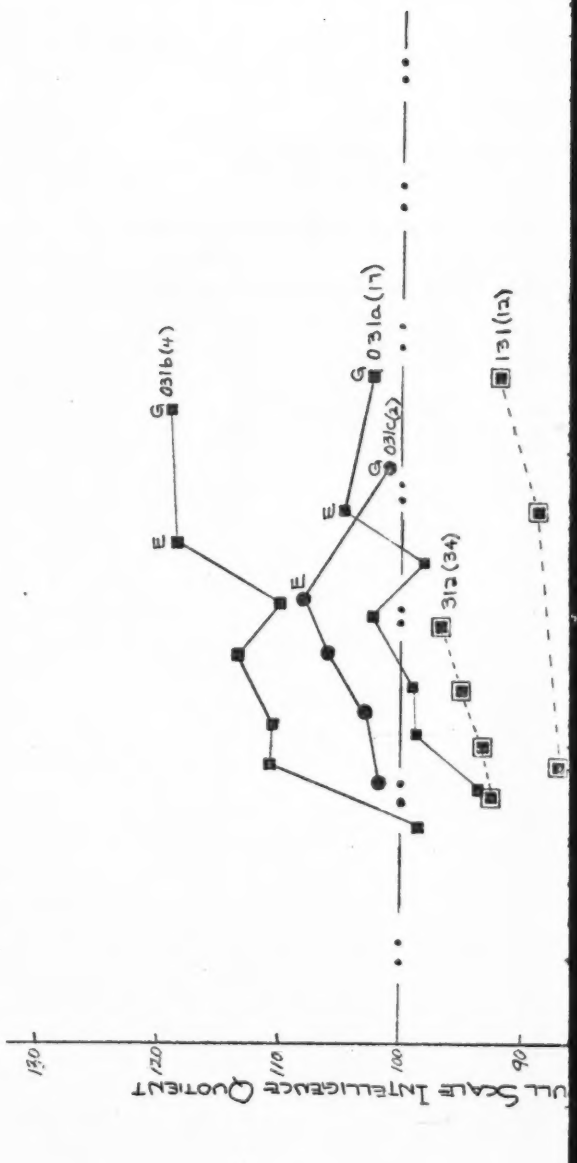

Table 6

Intelligence Scale for Children
andard Deviations for Target Area C
for 1966 through 1970

e n.	N	C.A. Mn.	C.A. S.D.	FIQ Mn.	FIQ S.D.
6	17	79.2	3.4	93.3	11.9
7	17	84.7	3.2	98.8	13.4
7	16	89.3	3.6	98.9	10.3
8	16	96.2	3.5	102.2	13.8
8	17	101.4	3.4	98.1	11.6
9	17	107.0	3.4	104.8	14.7
0	17	119.9	3.6	102.2	11.7
6	4	75.5	1.3	98.5	16.3
7	4	81.5	1.3	110.8	14.8
7	4	85.5	1.3	110.5	17.6
8	4	92.5	1.3	113.5	22.6
8	4	97.8	1.3	110.0	22.6
9	4	103.5	1.3	118.5	19.5
0	4	116.8	1.7	119.0	23.2
7	2	80.0	0.0	101.5	9.2
8	2	87.0	0.0	103.0	17.0
8	2	92.5	0.7	106.0	19.8
9	2	98.0	0.0	108.0	18.4
0	2	111.0	0.0	101.5	20.5
7	12	81.5	5.2	87.0	10.4
9	9	106.9	5.7	88.7	7.3
0	12	120.1	4.8	92.2	12.3
8	34	78.3	3.6	92.3	12.4
9	34	83.4	3.6	93.2	13.1
9	33	89.0	3.6	95.0	13.5
0	33	95.3	3.8	96.8	12.5

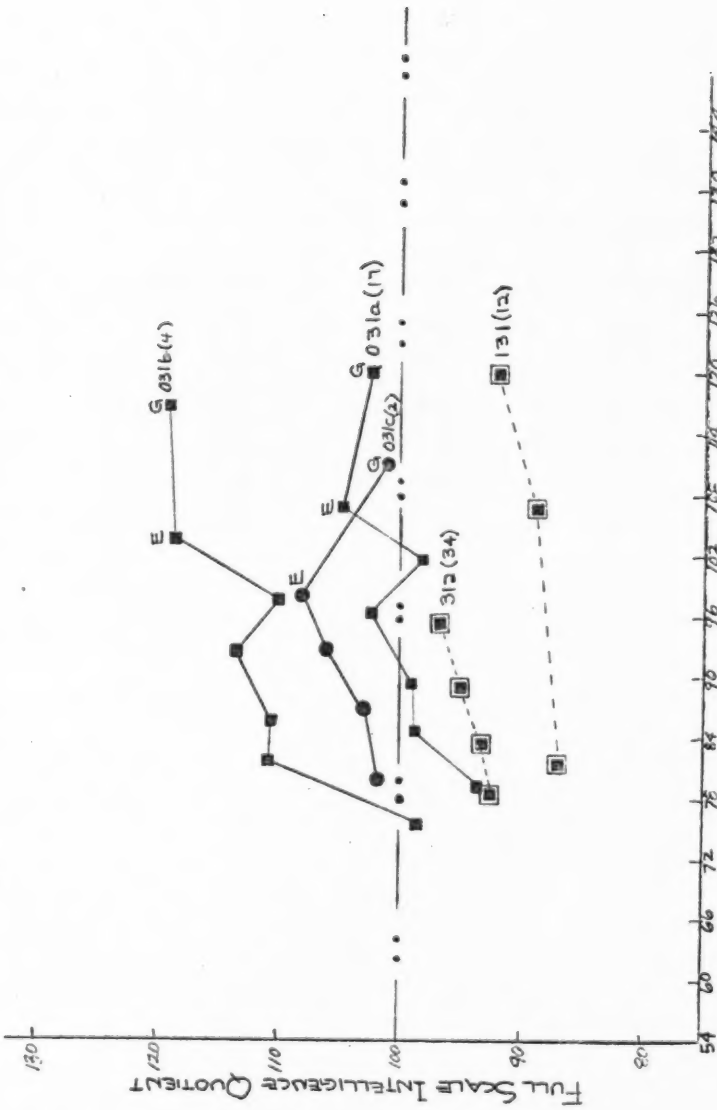

Fig. 8 WISC Full Scale Intelligence Quotient for all experimental control groups in Target Area C.

Table 7

Wechsler Intelligence Scale for Children
Means and Standard Deviations for Target Area D
for 1966 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	FIQ Mn.	FIQ S.D.
041a	2	F 66	7	78.9	3.6	92.6	15.5
		S 67	7	84.7	3.7	100.3	11.5
	3	F 67	6	89.7	3.2	97.7	12.6
		S 68	7	95.4	3.9	98.1	14.9
	4	F 68	7	100.9	3.6	97.1	12.8
		S 69	7	106.3	3.9	99.7	12.5
	5	S 70	7	119.1	4.1	96.9	12.7
041b	2	F 66	7	80.1	3.0	100.3	17.2
		S 67	7	85.6	3.0	105.7	18.6
	3	F 67	7	89.6	3.0	103.1	16.3
		S 68	7	96.0	3.2	107.0	17.5
	4	F 68	7	101.6	3.0	103.9	20.7
		S 69	7	107.4	3.3	103.1	19.5
	5	S 70	7	122.4	5.7	109.7	22.3
041c	3	F 67	3	98.7	13.9	77.3	3.5
		S 68	3	105.3	13.3	77.7	9.2
	4	F 68	3	110.7	13.9	85.7	5.8
		S 69	3	116.3	13.3	83.7	6.7
	5	S 70	3	129.3	12.3	81.7	2.5
042a	3	F 67	5	81.6	7.5	90.4	9.9
		S 68	5	86.8	8.5	97.2	4.6
	4	F 68	5	92.8	8.1	95.4	8.1
		S 69	5	98.2	8.5	94.2	7.9
	5	F 69	5	104.8	8.1	95.2	6.3
		S 70	5	110.6	8.2	97.4	9.7
042b	3	F 67	10	78.5	6.0	90.1	13.8
		S 68	10	83.2	6.1	90.4	14.3
	4	F 68	10	89.2	6.1	93.5	11.8
		S 69	10	94.6	5.9	93.0	13.4
	5	F 69	10	100.9	6.1	91.7	10.5
		S 70	10	106.9	5.9	91.8	13.1
044a	4	F 68	11	75.4	3.6	92.8	8.8

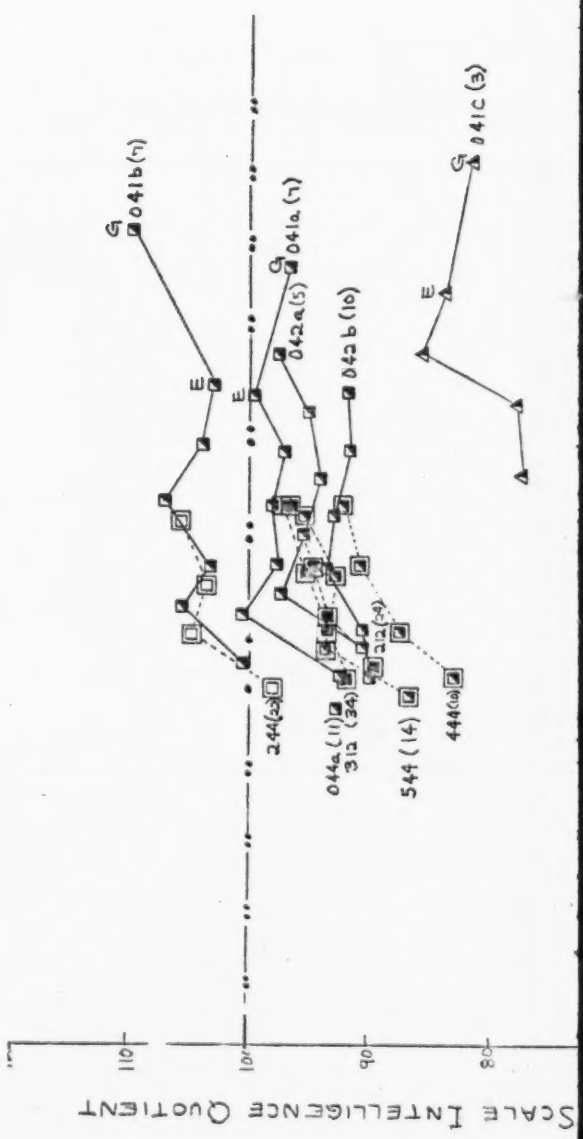

Table 7

nsler Intelligence Scale for Children
nd Standard Deviations for Target Area D
for 1966 through 1970

Date of Admin.	N	C.A. Mn.	C.A. S.D.	FIQ Mn.	FIQ S.D.
F 66	7	78.9	3.6	92.6	15.5
S 67	7	84.7	3.7	100.3	11.5
F 67	6	89.7	3.2	97.7	12.6
S 68	7	95.4	3.9	98.1	14.9
F 68	7	100.9	3.6	97.1	12.8
S 69	7	106.3	3.9	99.7	12.5
S 70	7	119.1	4.1	96.9	12.7
F 66	7	80.1	3.0	100.3	17.2
S 67	7	85.6	3.0	105.7	18.6
F 67	7	89.6	3.0	103.1	16.3
S 68	7	96.0	3.2	107.0	17.5
F 68	7	101.6	3.0	103.9	20.7
S 69	7	107.4	3.3	103.1	19.5
S 70	7	122.4	5.7	109.7	22.3
F 67	3	98.7	13.9	77.3	3.5
S 68	3	105.3	13.3	77.7	9.2
F 68	3	110.7	13.9	85.7	5.8
S 69	3	116.3	13.3	83.7	6.7
S 70	3	129.3	12.3	81.7	2.5
F 67	5	81.6	7.5	90.4	9.9
S 68	5	86.8	8.5	97.2	4.6
F 68	5	92.8	8.1	95.4	8.1
S 69	5	98.2	8.5	94.?	7.9
F 69	5	104.8	8.1	95.2	6.3
S 70	5	110.6	8.2	97.4	9.7
F 67	10	78.5	6.0	90.1	13.8
S 68	10	83.2	6.1	90.4	14.3
F 68	10	89.2	6.1	93.5	11.8
S 69	10	94.6	5.9	93.0	13.4
F 69	10	100.9	6.1	91.7	10.5
S 70	10	106.9	5.9	91.8	13.1
F 68	11	75.4	3.6	92.8	8.8

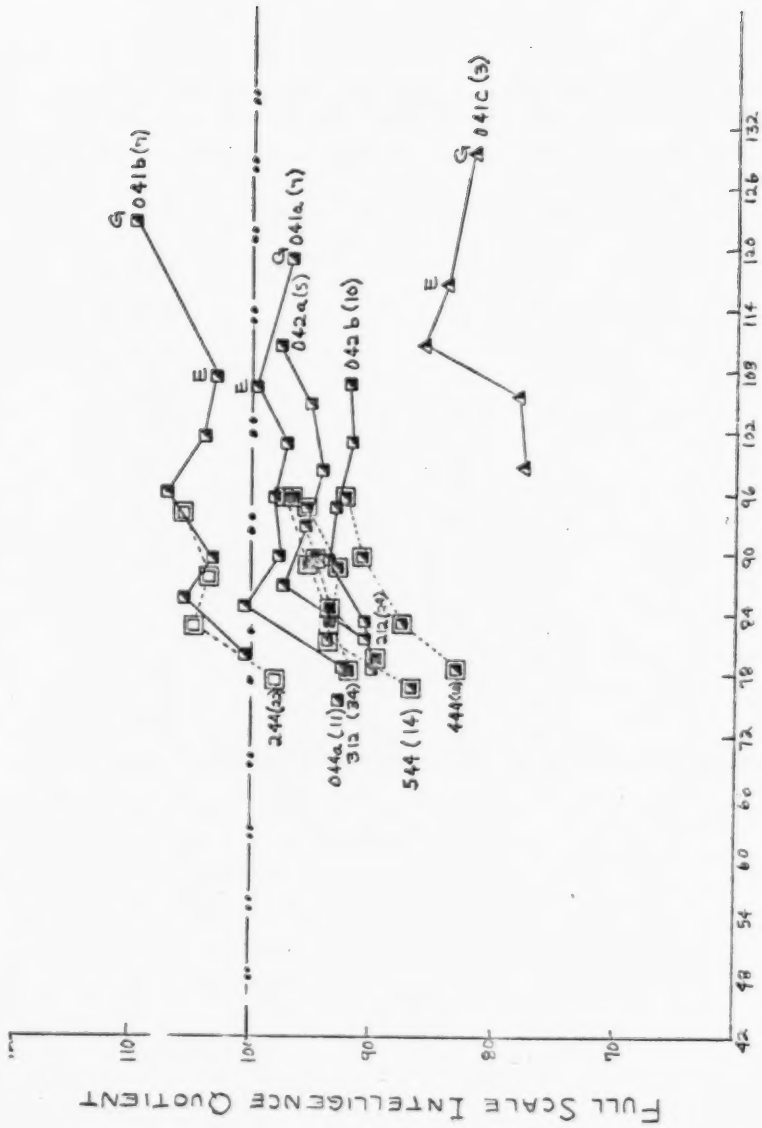

Fig. 9 WISC Full Scale Intelligence Quotients for all experimental and control groups in Target Area D

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Table 7 (continued) - Wechsler Intelligence Scale for Children
Means and Standard Deviations for Target Area D for 1966 through 1970

Group	Project Year	Date of Admin.	N	C.A. Mn.	C.A. S.D.	FIQ Mn.	FIQ S.D.
212	4	F 68	24	79.3	4.3	89.9	12.7
		S 69	23	84.3	4.3	93.5	12.1
	5	F 69	24	89.5	4.1	94.5	10.5
		S 70	24	95.3	4.1	96.5	13.6
244	4	F 68	22	77.4	3.5	98.1	13.6
		S 69	21	82.7	3.6	104.9	12.4
	5	F 69	22	87.6	3.6	103.3	12.5
		S 70	22	94.1	3.9	105.7	13.9
312	4	F 68	34	78.3	3.6	92.3	12.4
		S 69	34	83.4	3.5	93.2	13.1
	5	F 69	33	89.0	3.6	95.0	13.5
		S 70	33	95.3	3.8	96.8	12.5
444	4	F 68	10	78.5	4.6	83.1	14.6
		S 69	10	83.1	4.7	87.4	10.1
	5	F 69	10	89.5	4.6	90.7	10.8
		S 70	10	95.6	4.9	92.2	13.0
544	4	F 68	14	76.8	3.4	86.7	10.8
		S 69	14	81.6	3.5	93.5	13.4
	5	F 69	14	88.4	3.5	92.9	12.8
		S 70	14	94.4	3.2	95.3	12.3

Tests of Statistical Significance of Observed Changes

Several preliminary statistical comparisons were
selected experimental and control groups to test the n
in I.Q. change among treatment groups. It was not pos
tests relating to all of the research hypotheses and q
included in this report. However, a number which are
completed before the termination date of the project a
Further analyses will be reported in reports submitted

Significance of I.Q. Changes in Randomly Chosen Subjec

An analysis of variance was made comparing the fi
scores[1] of all randomly chosen experimental subjects (
011c, 012a, 021a, 022a, 031a, 032a, 041a, 041b) with r
subjects (Cohort groups 911, 912, 921, 922, 931, 932).
been selected from the same target area survey lists o
The experimental subjects received pretests and many t
also experienced the planned EIP educational interven
were identified by random selection in 1970 and tested
Binet in April or May 1970. The results of this analy
8 and 9.

These findings indicate that the null hypothesis
rejected at the .01 level of confidence. The assumptio
the EIP intervention significantly affected the perfor
children on the Stanford-Binet test of intelligence in

[1] As was noted earlier Stanford-Binet I.Q. scores were
WISC or WPPSI scores using regression analysis when S-B

echsler Intelligence Scale for Children
tions for Target Area D for 1966 through 1970

N	C.A. Mn.	C.A. S.D.	FIQ Mn.	FIQ S.D.
24	79.3	4.3	89.9	12.7
23	84.3	4.3	93.5	12.1
24	89.5	4.1	94.5	10.5
24	95.3	4.1	96.5	13.6
22	77.4	3.5	98.1	13.6
21	82.7	3.6	104.9	12.4
22	87.6	3.6	103.3	12.5
22	94.1	3.9	105.7	13.9
34	78.3	3.6	92.3	12.4
34	83.4	3.5	93.2	13.1
33	89.0	3.6	95.0	13.5
33	95.3	3.8	96.8	12.5
10	78.5	4.6	83.1	14.6
10	83.1	4.7	87.4	10.1
10	89.5	4.6	90.7	10.8
10	95.6	4.9	92.2	13.0
14	76.8	3.4	86.7	10.8
14	81.6	3.5	93.5	13.4
14	88.4	3.5	92.9	12.8
14	94.4	3.2	95.3	12.3

Tests of Statistical Significance of Observed Changes in I.Q.

Several preliminary statistical comparisons were made for this report between selected experimental and control groups to test the null hypothesis of no difference in I.Q. change among treatment groups. It was not possible to provide statistical tests relating to all of the research hypotheses and questions in time to be included in this report. However, a number which are of major importance were completed before the termination date of the project and these are presented here. Further analyses will be reported in reports submitted to professional journals.

Significance of I.Q. Changes in Randomly Chosen Subjects

An analysis of variance was made comparing the final Stanford-Binet I.Q. scores[1] of all randomly chosen experimental subjects (Cohort groups 011a, 011b, 011c, 012a, 021a, 022a, 031a, 032a, 041a, 041b) with randomly chosen control subjects (Cohort groups 911, 912, 921. 922, 931, 932). Both of these groups had been selected from the same target area survey lists obtained in 1965 and 1966. The experimental subjects received pretests and many tests during treatment. They also experienced the planned EIP educational interventions. The control subjects were identified by random selection in 1970 and tested only once with the Stanford-Binet in April or May 1970. The results of this analysis are presented in Tables 8 and 9.

These findings indicate that the null hypothesis of no difference can be rejected at the .01 level of confidence. The assumption is, therefore, made that the EIP intervention significantly affected the performance of the enrolled children on the Stanford-Binet test of intelligence in a desirable direction.

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[1] As was noted earlier Stanford-Binet I.Q. scores were computed from appropriate WISC or WPPSI scores using regression analysis when S-B scores were unavailable.

Table 7

Final Stanford-Binet Means and Standard Deviations for Randomly Selected Experimental and Control Subjects Chosen from the Same Target Area Lists

Group Code	Group	N	Mean	S.D.
A	Randomly Selected Experimental Group	113	95.87	11.8
B	Randomly Selected Control Group	66	89.55	12.5

Note: Where in a few cases Stanford-Binet scores were not available WISC or WPPSI Total I.Q.'s were computed by regression analysis and substituted. This procedure was used in all analyses of I.Q. scores.

Table 9

Analysis of Variance of Exit I.Q. Scores for Randomly Selected Experimental and Control Subjects

Source	SS	df	MS	F ratio
Between Groups	1665.14	1	1665.14	11.47*
Within Groups	25697.14	177	145.18	
Total	27362.28	178		

* $p < .01$

EIP children obtained significantly higher Stanfo
of their period of involvement in EIP than random
had not attended EIP (but were exposed to all oth
four target area communities). No other tests we
selected controls (Group B) since the children we
community and time for individual testing was lim

Significance of I.Q. Changes in all Groups - Rand

Since a great many of the children enrolled
those selected as controls) were non-randomly sel
were made using various combinations of groups, c

Comparison of I.Q. Changes between Randomly Selec
Matched Control Subjects

The ten experimental cohort groups (Group A)
(011a, 011b, 011c, 012a, 021a, 022a, 031a, 032a,
children randomly selected from survey lists made
C). These matched target areas were selected as
social, economic, and ethnic characteristics. Fo
into this category: 111, 112, 121, and 122 (Grou
comparison are presented in Tables 10 and 11.

These findings argue for the rejection of the
among treatments after adjusting for differences
experimental programs provided by EIP apparently
Stanford-Binet I.Q. which were sustained throughou
The I.Q.'s of children in the matched control grou
the period studied.

Table 8

-Binet Means and Standard Deviations for
Selected Experimental and Control
osen from the Same Target Area Lists

p	N	Mean	S.D.
xperimental Group	113	95.87	11.8
ontrol Group	66	86.55	12.5

s Stanford-Binet scores were not available WISC
's were computed by regression analysis and sub-
cedure was used in all analyses of I.Q. scores.

Table 9

of Variance of Exit I.Q. Scores
lected Experimental and Control Subjects

SS	df	MS	F ratio
65.14	1	1665.14	11.47*
7.14	177	145.18	
2.28	178		

EIP children obtained significantly higher Stanford-Binet I.Q. scores at the end of their period of involvement in EIP than randomly selected control children who had not attended EIP (but were exposed to all other assets and liabilities of the four target area communities). No other tests were administered to the randomly selected controls (Group B) since the children were scattered all over the Durham community and time for individual testing was limited.

Significance of I.Q. Changes in all Groups - Randomly and Non-randomly Selected

Since a great many of the children enrolled in EIP programs (and most of those selected as controls) were non-randomly selected, several comparisons were made using various combinations of groups, covariates, and dependent variables.

Comparison of I.Q. Changes between Randomly Selected Experimental Cohorts and Matched Control Subjects

The ten experimental cohort groups (Group A) which were randomly selected (011a, 011b, 011c, 012a, 021a, 022a, 031a, 032a, 041a, 041b) were compared with children randomly selected from survey lists made in matched target areas (Group C). These matched target areas were selected as neighborhoods having similar social, economic, and ethnic characteristics. Four control cohort groups fell into this category: 111, 112, 121, and 122 (Group C). The results of this comparison are presented in Tables 10 and 11.

These findings argue for the rejection of the hypothesis of no difference among treatments after adjusting for differences in I.Q. at entry to EIP. The experimental programs provided by EIP apparently accounted for modest gains in Stanford-Binet I.Q. which were sustained throughout the period of treatment. The I.Q.'s of children in the matched control groups declined slightly during the period studied.

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Table 10

Stanford-Binet Mean I.Q. Scores
for Randomly Selected Experimental and Control Subjects
Chosen from Matched Target Area Lists

Group Code	Group	N	Entry Mean	Exit Mean
A	Randomly Selected Experimental Subjects	113	93.71	95.87
C	Randomly Selected Controls from Matched Areas	29	80.62	79.59

Table 11

Analysis of Covariance of Exit
I.Q. Scores of Matched Subjects with 1 Covariate (Entry I.Q.)

Source	df	YY	SS Due to Regression	SS About Regression	df	MS
Between (treatments)	1	6117.00				
Within (error)	140	31437.00	7199.96	24237.04	139	174.37
Total	141	37554.00	11432.93	26121.07	140	
Difference				1884.03	1	1884.03

F (1,139) = 10.805, significant at $p < .01$.

Comparison of I.Q. Changes between all Exp

Subjects

An analysis of variance was computed

data were available in EIP classes and con

Follow-Through (a similar early childhood

means are presented in Table 12 and the r

Table 13.

Table 12

Mean Entry and Exit Stanford-Binet I.Q
and Control Subjects (exclusive o

Group Code	Group
D	EIP Subjects
E	Controls (excluding F-T)

Table 13

Analysis of Covariance o
of All Experimental and Control Subjects
with 1 Covariate

Source	df	YY	SS Reg
Between (treatment)	1	4425.00	
Within (error)	377	58721.00	30
Total	378	63146.00	33
Difference			

F (1,376) = 19.434, significant at $p < .001$

Table 10

ord-Binet Mean I.Q. Scores
cted Experimental and Control Subjects
rom Matched Target Area Lists

up	N	Entry Mean	Exit Mean
erimental Subjects	113	93.71	95.87
trols from Matched Areas	29	80.62	79.59

Table 11

sis of Covariance of Exit
d Subjects with 1 Covariate (Entry I.Q.)

YY	SS Due to Regression	SS About Regression	df	MS
117.00				
1437.00	7199.96	24237.04	139	174.37
7554.00	11432.93	26121.07	140	
		1884.03	1	1884.03

t $p < .01$.

Comparison of I.Q. Changes between all Experimental and Non-Follow-Through Control Subjects

An analysis of variance was computed using all subjects for whom I.Q. change data were available in EIP classes and control groups except those enrolled in Follow-Through (a similar early childhood intervention program). The appropriate means are presented in Table 12 and the results of analysis of covariance in Table 13.

Table 12

Mean Entry and Exit Stanford-Binet I.Q. Scores for All Experimental and Control Subjects (exclusive of Follow-Through pupils)

Group Code	Group	N	Mean Entry I.Q.	Mean Exit I.Q.
D	EIP Subjects	254	91.35	94.48
E	Controls (excluding F-T)	125	86.75	87.21

Table 13

Analysis of Covariance of Exit I.Q. Scores
of All Experimental and Control Subjects (exclusive of Follow-Through pupils)
with 1 Covariate (Entry I.Q.)

Source	df	YY	SS Due to Regression	SS About Regression	df	MS
Between (treatment)	1	4425.00				
Within (error)	377	58721.00	30335.13	28385.87	376	75.49
Total	378	63146.00	33293.00	29853.00	377	
Difference				1467.13	1	1467.13

$F(1,376) = 19.434$, significant at $p < .001$

This analysis indicated that the null hypothesis could be rejected at the .001 level of confidence. The experimental subjects gained in I.Q. to a significantly greater degree than the non-Follow-Through control subjects. When the Follow-Through children were included in the analysis (using WISC I.Q. scores) the F increased to 22.733. Table 14 presents the relevant group means and sizes.

Table 14

Mean Entry and Exit I.Q. Scores for All EIP and All Control Subjects (including those in Follow-Through)

Group Code	Group	N	Mean Entry I.Q.	Mean Exit I.Q.
D	EIP Subjects	254	91.35	94.48
F	Controls (including F-T)	183	88.92	88.93

ANOVA F (1,434) = 22.733, $p < .001$.
(adjusted for entry I.Q.)

Effects of Length of Treatment on Observed Differences in Exit I.Q. (adjusted for Entry I.Q.)

One finding which keeps reappearing in the literature on effects of early childhood intervention is the tendency for initial gains in I.Q. to wash out after the first year or two. To test the stability of EIP treatment effects after the initial effects of entry and testing had worn off only those subjects who had been in EIP or public school programs for 20 months (or more) were compared. The results of this analysis are presented in Tables 15 and 16.

Table 15

Mean Entry and Exit I.Q. S
EIP and Control Subjects who h
Programs 20 Months o

Group Code	Group
D	EIP Subjects - 20 mo. treatment
F	Controls (including F-T) - 20 mo. treat

Table 16

Analysis of Covariance of Exit
All Experimental and Control Subje
or More of School Experience (adju

Source	df	YY	SS Due Regress
Between (treatment)	1	2673.00	
Within (error)	170	28734.00	15630.
Total	171	31407.00	16943.
Difference			

F (1,169) = 17.529, $p < .001$.

These results support the rejection of the
the thesis that the EIP treatment was significan
remained in EIP for 20 months or more. Instead
two or more academic years, the entry to exit ga

he null hypothesis could be rejected at the .001
erimental subjects gained in I.Q. to a significantly
ollow-Through control subjects. When the Follow-
d in the analysis (using WISC I.Q. scores) the F
4 presents the relevant group means and sizes.

Table 14

nd Exit I.Q. Scores for All EIP
cts (including those in Follow-Through)

	N	Mean Entry I.Q.	Mean Exit I.Q.
	254	91.35	94.48
ing F-T)	183	88.92	88.93

< .001.

on Observed Differences in Exit I.Q. (adjusted for

eappearing in the literature on effects of early
tendency for initial gains in I.Q. to wash out after
t the stability of EIP treatment effects after the
sting had worn off only those subjects who had been
ms for 20 months (or more) were compared. The
resented in Tables 15 and 16.

Table 15

Mean Entry and Exit I.Q. Scores for All
EIP and Control Subjects who had been in School
Programs 20 Months or More

Group Code	Group	N	Mean Entry I.Q.	Mean Exit I.Q.
D	EIP Subjects - 20 mo. treatment	117	91.12	94.71
F	Controls (including F-T) - 20 mo. treatment	55	87.27	86.25

Table 16

Analysis of Covariance of Exit I.Q. Scores of
All Experimental and Control Subjects with 20 Months
or More of School Experience (adjusted for Entry I.Q.)

Source	df	YY	SS Due to Regression	SS About Regression	df	MS
Between (treatment)	1	2673.00				
Within (error)	170	28734.00	15630.06	13103.94	169	77.54
Total	171	31407.00	16943.88	14463.13	170	
Difference				1359.19	1	1359.19

$F(1,169) = 17.529$, $p < .001$.

These results support the rejection of the null hypothesis and acceptance of the thesis that the EIP treatment was significantly effective among those who remained in EIP for 20 months or more. Instead of finding a regression after two or more academic years, the entry to exit gains in I.Q. score made by EIP

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children who were in the program 3 or more academic years were almost the same as those made by the total EIP sample and no evidence of regression appeared. In comparison, public school children were found to show lower exit than entry I.Q. scores after three (or more) years of school attendance.

Comparison of I.Q. Changes between all Available Experimental and Control Subjects Tested with the ITPA at Entry

In this analysis all EIP subjects who had entry ITPA scores were included regardless of the manner of selection (whether for the Infant Project, recruited door to door, selected by target area principals, referred by agencies, or requested admission by parents). The effects of EIP treatments were compared with the normal treatments provided by the community in local public and private schools and/or the neighborhood. No Follow-Through subjects, however, were administered the ITPA (Tables 17 and 18).

Table 17

Mean Stanford-Binet I.Q. and ITPA Language Age Scores for All Experimental and Control Subjects Tested with the ITPA at Entry

Group Code	Group	N	Mean Entry ITPA	Entry I.Q.	Mean Exit I.Q.
D	EIP Subjects (with I.Q. and ITPA)	192	65.37	90.55	93.50
F	Control Subjects (with I.Q. and ITPA)	32	74.34	90.78	90.00

Table 18

Analysis of Covariance of Exit I
with 2 Covariates (Entry ITPA and

Source	df	YY	SS Due t Regress
Between (treatments)	1	336.00	
Within (error)	222	36172.00	18348.9
Total	223	36508.00	18171.9
Difference			

$F(1,220) = 6.332$, $p < .05$

This analysis led to the rejection of the nul
level of confidence. EIP subjects gained in teste
declined slightly, even though the control subject
tically, at entry. When the exit I.Q.'s were adju
I.Q. and ITPA the difference between groups in exi
nificant at the .05 level.

Effects of EIP Interventions on the Distribution o

Arthur Jensen has commented in the Harvard Edu
"actual" distribution of I.Q.'s in the population
"there are more very low I.Q.'s than would be expec
distribution, and also there is an excess of I.Q.'
scale." Jensen makes note, as well, of a slight ex
range between 70 and 90. A second distribution of
I.Q.'s below 60 is mentioned in his discussion and
tion (Figure 2, p. 25) shows the two overlapping di

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ildren were found to show lower exit than entry
e) years of school attendance.

en all Available Experimental and Control Subjects

bjects who had entry ITPA scores were included
ction (whether for the Infant Project, recruited
area principals, referred by agencies, or
The effects of EIP treatments were compared with
the community in local public and private schools
low-Through subjects, however, were administered

Table 17

TPA Language Age Scores for All Experimental
s Tested with the ITPA at Entry

	N	Mean Entry ITPA	Entry I.Q.	Mean Exit I.Q.
ITPA)	192	65.37	90.55	93.50
and ITPA)	32	74.34	90.78	90.00

Table 18

Analysis of Covariance of Exit I.Q. Scores
with 2 Covariates (Entry ITPA and Entry I.Q.)

Source	df	YY	SS Due to Regression	SS About Regression	df	MS
Between (treatments)	1	336.00				
Within (error)	222	36172.00	18348.98	17823.02	220	81.0137
Total	223	36508.00	18171.97	18336.03	221	
Difference				513.01	1	513.01

$F(1,220) = 6.332$, $p < .05$

This analysis led to the rejection of the null hypothesis at the .05 level of confidence. EIP subjects gained in tested I.Q. while control subjects declined slightly, even though the control subjects were more mature, linguistically, at entry. When the exit I.Q.'s were adjusted for differences in entry I.Q. and ITPA the difference between groups in exit I.Q. was statistically significant at the .05 level.

Effects of EIP Interventions on the Distribution of I.Q. Scores

Arthur Jensen has commented in the Harvard Educational Review (1969) on the "actual" distribution of I.Q.'s in the population (p.24). He points out that "there are more very low I.Q.'s than would be expected in a truly normal distribution, and also there is an excess of I.Q.'s at the upper end of the scale." Jensen makes note, as well, of a slight excess of cases in the I.Q. range between 70 and 90. A second distribution of defective persons with I.Q.'s below 60 is mentioned in his discussion and an accompanying illustration (Figure 2, p. 25) shows the two overlapping distributions.

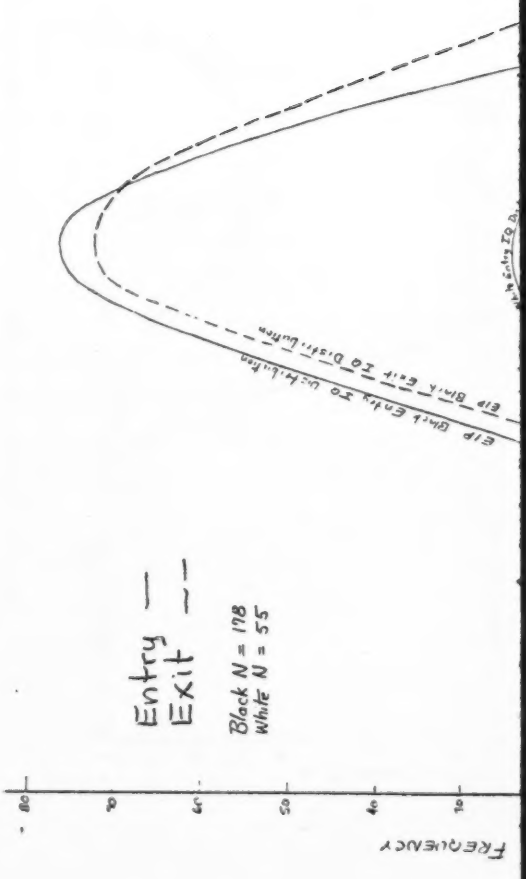
For comparison with Jensen's reported distribution of actual population I.Q.'s the distributions of EIP experimental subjects and their controls were plotted. The data are represented graphically in Figures 10 and 11.

The two figures have several points of interest. The second, overlapping distribution of I.Q.'s below 60 mentioned by Jensen shows up in the EIP entry scores, in both the black and white samples. The EIP experimental population included a majority of randomly drawn subjects. In contrast, the control distributions did not include any cases below 57. Since the controls included in these data were drawn from public schools one possibility is that the children with I.Q.'s lower than 60 were screened out.

Another point of interest relates to the changes found in the I.Q. distributions of both black and white children in the EIP sample. The effect of the EIP programs was to eliminate the bimodal shape of the EIP distributions and move them to the right (that is, to increase the means). The two control distributions remained about the same.

These results suggested that the greatest effects of the EIP programs were upon the children at the two extremes of the distributions. Children who usually have been excluded from entry to public school were enabled to perform at a level closer to the norm for the local public schools (as represented by the controls) and children at the upper extreme were able to demonstrate more complex (Level II?) patterns of thought.

These results are sufficiently dramatic to call into question the assumption made by Jensen (p. 116, Fig. 20) that Level II developmental patterns are fixed in low socio-economic status populations. EIP programs were intended to teach problem-solving (without teaching test items per se). The results



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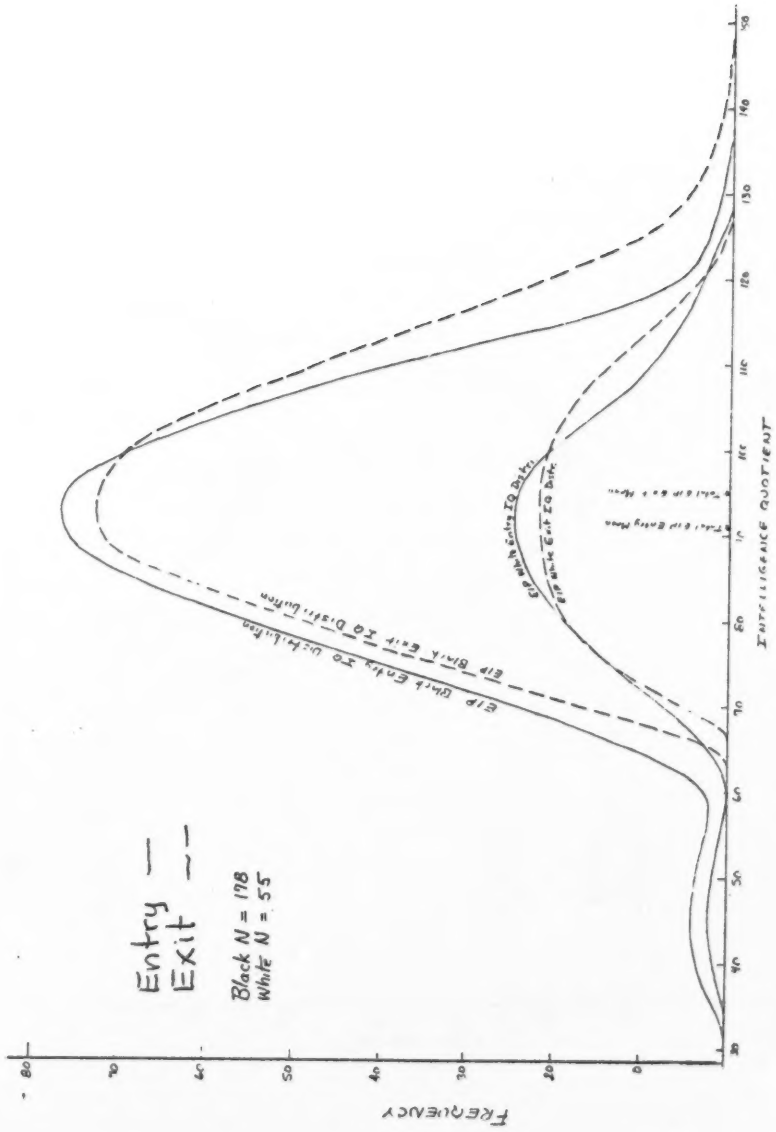

Fig. 10 Frequency distribution of EIP I.Q. scores at entry and at exit.

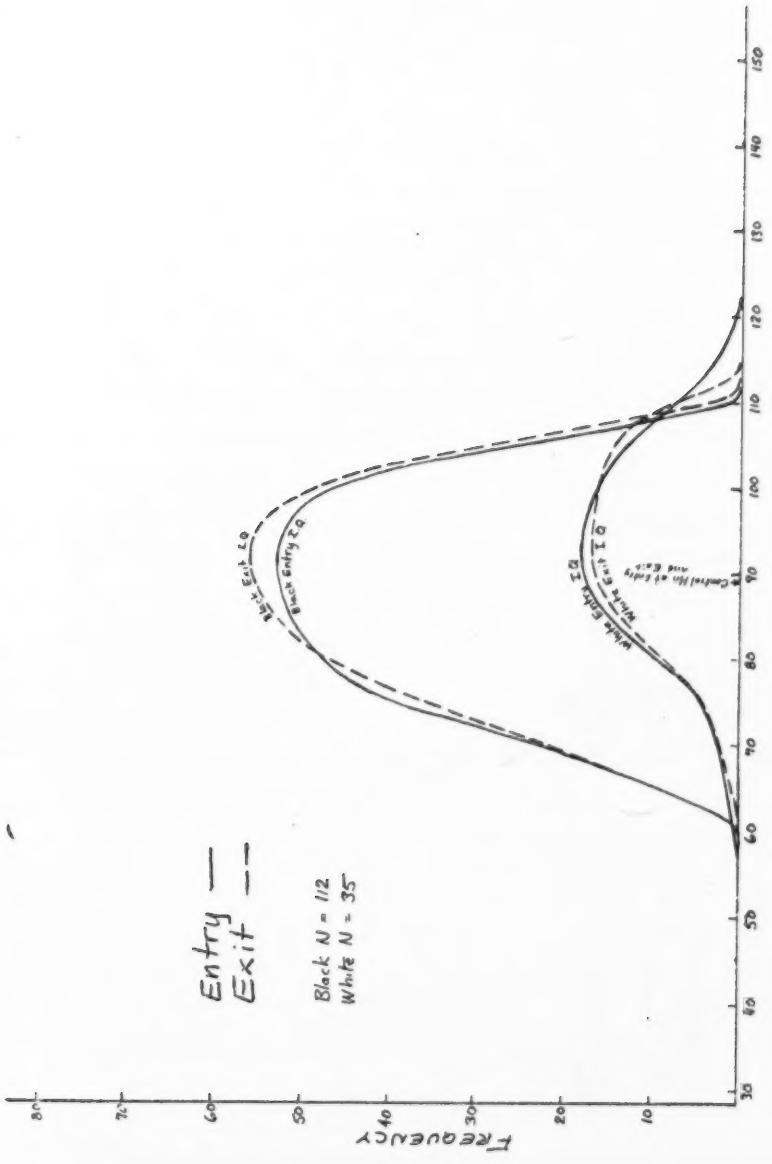

Fig. 11 Frequency distribution of control I.Q. scores at entry and at exit.

obtained for the control children (enrolled in
learning) support Jensen's position. The result
Jensen's position is tenable, perhaps, only as
to teach the cognitive skills and develop the co
characterize higher forms of intelligence (Level

Jensen's analysis of traditional methods of
makes a point of the emphasis commonly made on c
this to the development of public school teachin
middle-class characteristics. Public school aut
and complex thinking and teachers expect childre
problem-solving in young children is rarely taug
cherished when it is found but teachers do not,
or the early grades to foster or develop it. Wh
been taught by parents.

The EIP findings suggest that teachers can t
that the results obtained in previous studies of
school populations are not likely to be replicate
geared to the teaching of thinking. In contrast,
emphasizes associative learning (Level I) as Jens
confirm previous findings and further institution
bondage accidentally created in the past by imper
well-meaning public school personnel.

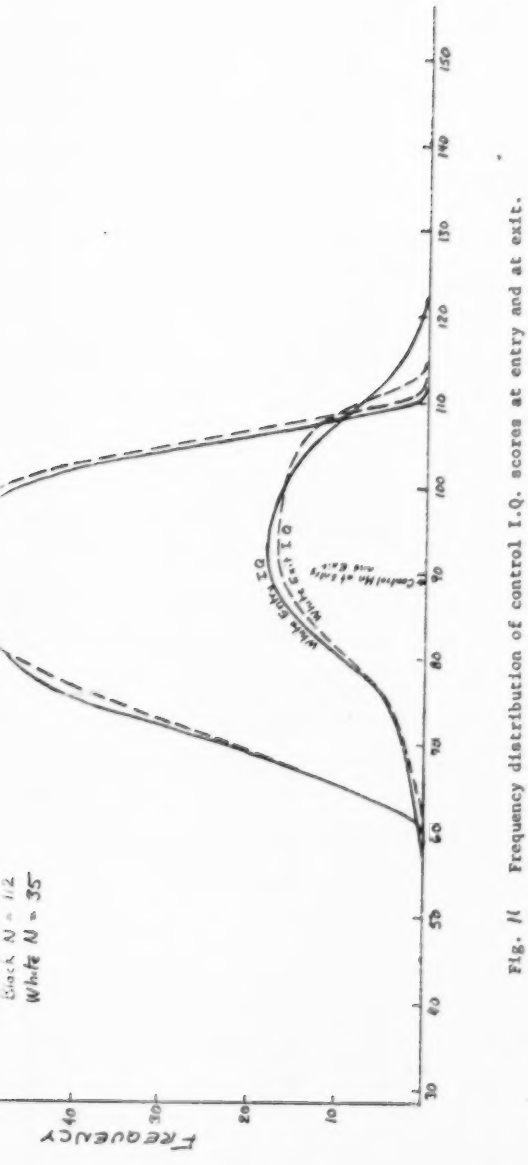

Fig. 11 Frequency distribution of control I.Q. scores at entry and at exit.

obtained for the control children (enrolled in schools emphasizing associative learning) support Jensen's position. The results from EIP treatment do not. Jensen's position is tenable, perhaps, only as long as schools are not structured to teach the cognitive skills and develop the conceptual structures which characterize higher forms of intelligence (Level II).

Jensen's analysis of traditional methods of classroom instruction (p. 115) makes a point of the emphasis commonly made on cognitive learning and he traces this to the development of public school teaching methods in populations having middle-class characteristics. Public school authorities do value problem-solving and complex thinking and teachers expect children to be able to think. However, problem-solving in young children is rarely taught. It is sometimes rewarded and cherished when it is found but teachers do not, generally, set out in kindergarten or the early grades to foster or develop it. When it occurs it most likely has been taught by parents.

The EIP findings suggest that teachers can teach young children to think and that the results obtained in previous studies of disadvantaged children in public school populations are not likely to be replicated if early interventions are geared to the teaching of thinking. In contrast, to teach in a manner which emphasizes associative learning (Level I) as Jensen suggests, would tend to confirm previous findings and further institutionalize a pattern of intellectual bondage accidentally created in the past by impersonal socio-economic forces and well-meaning public school personnel.

Effects of EIP Treatments on Academic Achievement

The Metropolitan Achievement Test (MAT), Primary I, II and Elemetary batteries, was used to measure academic progress. These instruments had been used in the past by the cooperating schools in Durham and they have been employed in a variety of contemporary studies of the influence of early childhood educational interventions.

The main hypothesis regarding academic achievement predicted that "by the end of the third year of the ungraded primary the distribution of achievement scores on the Metropolitan Achievement Test (MAT), Elementary Form, will equal or exceed the national norms for the test."

Four EIP classes (incorporating 10 cohort groups) completed the third year of the ungraded primary. These were 022, 031, 041, and 042. Of the several cohorts making up these four classes only one (031b) achieved above the MAT norms in every sub-test at the end of the third year. This group of four (all girls) was selected by the Target Area C school principal and added to the 031a group when the 031a cohort group entered the first year of the ungraded primary. The four girls were probably not representative of the target area population. Thei entry mean I.Q. was 98.5 (WISC).

The 031a (N-17) and 031c (N-2) groups performed exceptionally well in comparison with control groups and other EIP groups but they both failed to surpass the national norm for the Word Knowledge and Reading sub-tests. The 031a cohort also fell below the norm in the Word Discrimination and Language subtests.

These Target Area C children (suburban, black) were the ones who made the greatest progress in EIP. All the other experimental groups scored below the MAT norms in every sub-test at the end of the third year of the EIP primary. Clearly the prediction of achievement above the MAT norms was not realized in the Target Area B and D Schools. The eldest group of pupils in Target Area A had completed the second year of the primary when the project was terminated. At that point the 21 children in the class (composed of cohorts 012a and 012c) had achieved a mean above the MAT national norm in only two sub-tests - Word Discrimination and Spelling. These children were clearly superior to the Head Start control group (212) but the criterion s had definitely not been reached.

Comparison of EIP Pupil Achievement with Cont

Five analyses of covariance were done co groupings of EIP subjects on the MAT with ava MAT means for EIP children at the end of the the ungraded primary were compared with MAT m matched public school and Follow-Through clas in all target areas were pooled in these anal for differences in initial I.Q. The results

EIP Treatments on Academic Achievement

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ldren in the class (composed of cohorts 012a and 012c)
e the MAT national norm in only two sub-tests - Word
ing. These children were clearly superior to the Head Start control group (212) but the criterion set at the beginning of the project had definitely not been reached.

Comparison of EIP Pupil Achievement with Controls

Five analyses of covariance were done comparing the performance of various groupings of EIP subjects on the MAT with available public school control groups. MAT means for EIP children at the end of the first, second, and third years of the ungraded primary were compared with MAT means obtained by children in the matched public school and Follow-Through classes. Scores obtained by children in all target areas were pooled in these analyses and the means were adjusted for differences in initial I.Q. The results are summarized in Table 19.

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Table 19

Metropolitan Achievement Test (MAT) Means[a] and Analysis of Covariance F Values (adjusted for Entry I.Q.) for Various EIP Subjects and Control Groups at Four Grade Levels

Group	N	MAT Sub-tests						
		Word Know.	Word Disc.	Read.	Spell.	Total Lang.	Arith. Comp.	Arith. Pr. S.
EIP Subjects at End of First Year vs. Public 1st Grade								
EIP	96	39.95	41.48	41.71	---	---	39.51	---
Controls	75	43.95	45.52	44.32	---	---	40.25	---
F	(1,168)	11.554	8.261	4.882			0.053	
p		<.001	<.01	<.05			ns	
EIP Subjects at End of Second Year vs. Public 2nd Grade								
EIP	103	42.06	44.51	40.91	16.45[a]	---	46.43	---
Controls	142	39.69	42.02	39.19	15.23	---	44.35	---
F	(1,242)	2.648	2.690	0.968	0.930		2.225	
p		ns	ns	ns	ns		ns	
EIP Subjects at End of Third Year vs. Public 3rd Grade								
EIP	68	40.54	41.41	39.90	15.84	42.96	38.93	42.04
Controls	38	40.66	43.24	39.87	14.79	42.79	41.24	42.34
F	(1,103)	0.197	2.414	0.184	0.016	0.055	2.476	0.166
p		ns	ns	ns	ns	ns	ns	ns
EIP Pre-school Graduates at End of Public 1st Grade vs. Public 1st Grade								
EIP	29	43.45	44.04	43.62	---	---	33.76	---
Controls	75	43.95	45.52	44.32	---	---	40.25	---
F	(1,101)	0.773	1.901	0.915			13.405	
p		ns	ns	ns			<.001	
EIP Primary Graduates at End of Public 4th Grade vs. Public 4th Grade								
EIP	40	48.63	48.68	46.82	27.03	54.28	50.45	57.20
Controls	30	43.10	45.20	42.17	21.33	48.93	49.60	52.60
F	(1,67)	1.259	0.015	0.360	0.716	0.720	1.701	0.019
p		ns	ns	ns	ns	ns	ns	ns

[a]Standard Score means are given except for Spelling, in which raw scores were used.

As expected, EIP subjects performed signific
of the first year of the ungraded program (in cou
ular public school classes). As can be noted in
first grade subjects obtained significantly highe
Knowledge, Word Discrimination, and Reading. A n
was found in Arithmetic. This result was expecte
sized socialization, problem-solving, and discove
however, such an approach was expected to lead to
later test batteries when thinking and problem-so
and speed of recall, are given greater emphasis.

By the end of the second year in EIP the exp
superior (but not significantly higher) mean scor
However, this pattern of markedly improved perfor
the third year. Data for the third year comparis
difference between the experimentals and controls.

Results of MAT Comparisons for Pupils One Year Ou

Two comparisons of the public school perform
public school pupils were made for this report.
public school first grades after experiencing EIP
performed significantly less well than their cont
subtest. Non-significant differences were found
but in no case were the MAT means for EIP presch
control group means.

In the fourth grade comparison the EIP gradu
on every MAT subtest but differences in initial I
for the observed MAT differences.

Table 19

ment Test (MAT) Means[a] and Analysis
(adjusted for Entry I.Q.) for Various
ontrol Groups at Four Grade Levels

MAT Sub-tests				
Read.	Spell.	Total Lang.	Arith. Comp.	Arith. Pr. S.
of First Year vs. Public 1st Grade				
41.71	---	---	39.5	---
44.32	---	---	40.2	---
4.882			0.0	3
<.05			ns	
of Second Year vs. Public 2nd Grade				
40.91	16.45[a]	---	46.4	---
39.19	15.23	---	44.3	---
0.968	0.930		2.2	5
ns	ns		ns	
of Third Year vs. Public 3rd Grade				
39.90	15.84	42.96	38.9	42.04
39.87	14.79	42.79	41.2	42.34
0.184	0.016	0.055	2.4	6 0.166
ns	ns	ns	ns	ns
End of Public 1st Grade vs. Public 1st Grade				
43.62	---	---	33.7	---
44.32	---	---	40.2	---
0.915			13.4	5
ns			<.0	1
of Public 4th Grade vs. Public 4th Grade				
46.82	27.03	54.28	50.4	57.20
42.17	21.33	48.93	49.60	52.60
0.360	0.716	0.720	1.7	1 0.019
ns	ns	ns	ns	ns

iven except for Spelling, in which raw scores were

As expected, EIP subjects performed significantly less well at the end of the first year of the ungraded program (in comparison with children in regular public school classes). As can be noted in Table 84 the matched public first grade subjects obtained significantly higher standard scores in Word Knowledge, Word Discrimination, and Reading. A non-significant difference was found in Arithmetic. This result was expected since the EIP curriculum emphasized socialization, problem-solving, and discovery learning. If effective, however, such an approach was expected to lead to higher MAT performance in later test batteries when thinking and problem-solving, in contrast to memory and speed of recall, are given greater emphasis.

By the end of the second year in EIP the experimental subjects obtained superior (but not significantly higher) mean scores in every subtest of the MAT. However, this pattern of markedly improved performance was not continued into the third year. Data for the third year comparison indicated no significant difference between the experimentals and controls.

Results of MAT Comparisons for Pupils One Year Out of EIP

Two comparisons of the public school performance of EIP graduates with public school pupils were made for this report. Children who entered regular public school first grades after experiencing EIP pre-school and/or kindergarten performed significantly less well than their controls in the MAT Arithmetic subtest. Non-significant differences were found in the other three subtests, but in no case were the MAT means for EIP preschool graduates higher than the control group means.

In the fourth grade comparison the EIP graduates obtained higher mean scores on every MAT subtest but differences in initial I.Q. were sufficient to account for the observed MAT differences.

Effects of EIP Treatments on Language Development

Although no effort was made to gather ITPA language performance data on all experimental subjects, a number of special studies using matched groups were completed. After these special studies were made, the ITPA was administered periodically throughout the remaining years of the Project to all subjects who had participated in the special studies. Additional experimental and control subjects were added to this pool to provide a more adequate longitudinal sample from the four target areas.

Comparison of Changes in ITPA Scores Between EIP Subjects and Matched Controls

When subjects in the four target areas were matched on entry I.Q., sex, ethnic origin, and target area and compared on gains in ITPA Total Language Age no significant differences were found. Table 20 presents the appropriate data. An analysis of variance produced a non-significant F.

Table 20

Mean I.Q. and ITPA Scores at Entry and
Mean Exit ITPA Scores for Selected Experimental and Control Subjects

Group Code	Group	N	Mean Entry ITPA	Mean Entry I.Q.	Mean Exit ITPA
D	Experimentals (with appro. scores)	190	65.11	90.86	80.58
F	Controls (with appro. scores)	32	74.34	90.78	84.53

Even though matched on several variables (I.Q., sex, ethnicity, and target area) the two groups in Table 20 were found to differ substantially in entry ITPA Language Age (about 9.2 months). When an analysis of covariance was computed adjusting for differences in entry ITPA Language Age a non-significant F was obtained. The EIP treatment was not found to have a different effect on language development as measured by the ITPA (in comparison with matched controls).

Effects of Age of Entry and Length of EIP Treatme

Age Scores

In order to test the effects of age of entry treatment (in EIP) a four by three analysis of co entry and three lengths of treatment were employe were adjusted for differences in initial ITPA Lan

Table 21

Design of Four by Three Analysis o

Entry Age	Length: Level 1 (4 to 16 mo.)	L (17 t
Level 1 - 2 & 3 yr. olds	N = 2	
Level 2 - 4 yr. olds	N = 2	
Level 3 - 5 yr. olds	N = 2	
Level 4 - 6, 7, & 8 yr. olds	N = 21	

The design presented in Table 21 grouped c ages according to length of participation in EIP. about 9 months those who had attended approximate the first column. Those with 2 or 3 academic yea two. Pupils who remained 4 or 5 school years were Table 22 presents the mean gains in ITPA Langua justed for differences in initial ITPA L.A.). Res variance (adjusting final ITPA Language Ages for i initial ITPA Language Age) are given in Table 23.

reatments on Language Development

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Scores Between EIP Subjects and Matched Controls

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and compared on gains in ITPA Total Language Age
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ment was not found to have a different effect on
ed by the ITPA (in comparison with matched controls).

Effects of Age of Entry and Length of EIP Treatment on Gains in ITPA Language Age Scores

In order to test the effects of age of entry to EIP programs and length of treatment (in EIP) a four by three analysis of covariance was made. Four ages of entry and three lengths of treatment were employed. Final ITPA Language Ages were adjusted for differences in initial ITPA Language Age.

Table 21

Design of Four by Three Analysis of Covariance

	Length of Treatment		
Entry Age	Level 1 (4 to 16 mo.)	Level 2 (17 to 28 mo.)	Level 3 (29 to 40 mo.)
Level 1 - 2 & 3 yr. olds	N = 2	N = 17	N = 10
Level 2 - 4 yr. olds	N = 2	N = 17	N = 5
Level 3 - 5 yr. olds	N = 2	N = 10	N = 22
Level 4 - 6, 7, & 8 yr. olds	N = 21	N = 61	N = 18

The design presented in Table 21 grouped children with various entry ages according to length of participation in EIP. Since the school year extended about 9 months those who had attended approximately one year were included in the first column. Those with 2 or 3 academic years in EIP were placed in column two. Pupils who remained 4 or 5 school years were included in the third column. Table 22 presents the mean gains in ITPA Language Age for the 12 cells (unadjusted for differences in initial ITPA L.A.). Results of the analysis of covariance (adjusting final ITPA Language Ages for differences between groups on initial ITPA Language Age) are given in Table 23.

Table 22

Mean Gains in ITPA Language Age by Age of Entry and Length of Treatment

	Length of Treatment		
Age of Entry	4 to 16 mo.	17 to 28 mo.	29 to 40 mo.
2 or 3 yrs.	5.00	21.53	19.20
4 yrs.	4.50	23.53	24.60
5 yrs.	7.00	20.60	13.73
6, 7, or 8 yrs.	13.81	14.82	6.89

Table 23

Analysis of Covariance
Effects of Age of Entry and Length of Treatment on Final ITPA Language Age
(adjusted for initial ITPA L.A.)

Source	SS	df	MS	F	p less than
Within cells	18012.27	174	103.52		
Regression	11254.14	1	11254.14	108.716	.001
A (age of entry)	213.54	3	71.18	0.688	.561
B (length of treatment)	867.22	2	433.61	4.189	.017
AB (interaction)	1389.25	6	231.54	2.237	.042

The results presented in Tables 22 and 23 suppo
the null hypothesis of no difference ($p < .017$) in
treatment. No significant main effects of age of e

The EIP treatments were significantly more effe
Language Age when continued for 17 to 38 months. Be
period diminishing rates of improvement were observe

The significant interaction found between effec
length of treatment suggests that the most efficient
children in an EIP type of treatment at age 4 provid
vention can be continued for at least 17 months (two
only one year of special compensatory programming of
the greatest effect (at the end of one year) may be
enrolled at 6 or 7 years of age.

Table 22

ains in ITPA Language Age by Age Entry and Length of Treatment

	Length of Treatment		
mo.	17 to 28 mo.	29 to 40 mo.	
	21.53	19.20	
	23.53	24.60	
	20.60	13.73	
	14.82	6.89	

Table 23

Analysis of Covariance
s of Age of Entry and Length of
ment on Final ITPA Language Age
justed for initial ITPA L.A.)

	df	MS	F	p less than
27	174	103.52		
14	1	11254.14	108.716	.001
54	3	71.18	0.688	.561
22	2	433.61	4.189	.017
25	6	231.54	2.237	.042

The results presented in Tables 22 and 23 support the rejection of the null hypothesis of no difference ($p < .017$) in the case of length of treatment. No significant main effects of age of entry were observed.

The EIP treatments were significantly more effective in increasing ITPA Language Age when continued for 17 to 38 months. Beyond (or under) that period diminishing rates of improvement were observed.

The significant interaction found between effects of age of entry and length of treatment suggests that the most efficient strategy is to enroll children in an EIP type of treatment at age 4 providing the special intervention can be continued for at least 17 months (two academic years). If only one year of special compensatory programming of the EIP type is possible the greatest effect (at the end of one year) may be expected among those enrolled at 6 or 7 years of age.

These findings do not suggest that the EIP socialization program (in combination with various experimental curricula) was sufficient to prepare these children for the public schools as they are currently organized. EIP graduates demonstrated the same pattern of declining academic performance as their controls at the fourth grade level. In fact, incidental information gathered during the project suggested that the EIP program was counter-productive when the expectations of the public schools were considered. Parents, teachers, and children reported many instances in which EIP graduates were too independent, talkative, and active when they entered public schools. Their self-directive, problem-solving styles were in open conflict with the existing mores of the schools.

Differences in Effects of Various Experimental Curricula

Since the EIP teacher training approach emphasized individualization and problem-solving by teachers the instructional programs worked out by the teaching teams in the four target areas differed widely. Although statistical tests by target area (or by curricular element) are not yet available, an inspection of the data provided some information regarding obvious differences:

1. The academic curriculum used in Target Area B was singularly ineffective in preparing the pupils for achievement tests such as the MAT. The teachers in this school had used an experience story approach, supplemented with Sullivan linguistic readers and the Ginn basal program. The Greater Cleveland mathematics series was used as well. During the third year a remedial program using a variety of individualized techniques such as the Fernald method was provided, employing three trained teachers (in sequence) assisted by an aide.

Results at the end of the third year w
compared with those obtained in prior
viously doing better in class sessions
testing situation was poor and the res
improvement.

2. The curriculum developed in Target Are
most effective. It was highly indivi
developed by Caleb Gattegno (Words in
which emphasize problem-solving with
code in reading and colored rods in a
methods were supplemented with experi
(using Harr Wagner Word Boxes), SRA a
and SRA Reading Laboratories.

3. After the first year, cross-age group
and the more advanced children were e
children. Second and third year chil
the fourth and fifth years of the Pro
those observed earlier (Project years

Post hoc explanations are useful primarily
tested in future studies. The MAT differences o
are suggestive but they cannot be accepted as ev
instructional materials and methods used in Targ
generalizing these results is warranted also bec
ular overlap between the programs developed in e
schools. Relationships between curricular eleme
be the subject of future statistical analyses an

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Results at the end of the third year were only slightly improved compared with those obtained in prior years. The pupils were obviously doing better in class sessions but response to the MAT testing situation was poor and the resultant scores showed no improvement.

2. The curriculum developed in Target Area C appeared to be the most effective. It was highly individualized and utilized methods developed by Caleb Gattegno (Words in Color and Numbers in Color) which emphasize problem-solving with the aid of a colored, phonic code in reading and colored rods in arithmetic. These materials and methods were supplemented with experience stories, creative writing (using Harr Wagner Word Boxes), SRA and Sullivan linguistic readers, and SRA Reading Laboratories.

3. After the first year, cross-age grouping was used in Target Area C and the more advanced children were employed as tutors of younger children. Second and third year children assisted the teacher during the fourth and fifth years of the Project with results which reflected those observed earlier (Project years two and three) in Target Area C.

Post hoc explanations are useful primarily as sources of hypotheses to be tested in future studies. The MAT differences observed in the four target areas are suggestive but they cannot be accepted as evidence of the superiority of the instructional materials and methods used in Target Areas A and C. Caution in generalizing these results is warranted also because of the high degree of curricular overlap between the programs developed in each of the four Target Area schools. Relationships between curricular elements and pupil achievement will be the subject of future statistical analyses and reports.

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Conclusions

What Has Been the Impact of EIP on the Children?

Findings:

1) Socialization

- Changes in social behavior were found to be more a function of specific setting variables than entry age. Among the relevant setting variables, teacher behavior was found the most salient. Social reinforcers and limit setting behaviors (on the part of adults present) were found to shape pupil social behavior independently of age of entry to EIP treatment programs. The longer a child remained in EIP the more independently productive he became in non-teacher-directed classroom settings, without concurrent decrements in conforming and cooperative behavior in teacher-directed situations.

2) Intellectual Development

- Children with no pre-school experience were found to decline rapidly in tested I.Q. during or shortly after the second year of life. This decline amounted to a total of approximately 10 to 15 points during the third and fourth years. After about age four or five the decline slowed to 2 or 3 points per year.
- EIP experimental programs were found to reverse the decline in tested I.Q. Experimental subjects gained, on the average, a total of 5 or 6 points during their participation in EIP programs. Gains made early in the experimental programs were not washed out after two or three years of EIP school experience.
- Control group children were observed to ha
  entry to public school.
- The younger a child entered an EIP sequenc
  higher he was likely to score on the Stanf
  was due, apparently, to the fact that the
  at entry, declined less (in comparison wit
  older entry ages) rather than to differenc
  various chronological ages. Length of EIP
  related to gains in tested I.Q. Similar g
  children whether they experienced one or m
  were not observed to follow gains made ear
- The distribution of I.Q. scores obtained b
  approached a normal probability curve, wit
  5 points less than the test norms. A bimo
  at entry was no longer apparent at exit.

3) Language Development

- EIP treatments were not found to have diff
  (ITPA) development in comparison with chil
  groups. However, the EIP educational prog
  ficantly more effective if continued for 2
  comparison with a one year EIP interventio
  resulted in significantly greater ITPA gai
  dren when they were enrolled for two or mo
  of four (in comparison with other lengths
  entry).

Conclusions

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chool experience.

- o Control group children were observed to have constant I.Q. scores after entry to public school.
- o The younger a child entered an EIP sequence of educational programs the higher he was likely to score on the Stanford-Binet at exit. This result was due, apparently, to the fact that the younger children's I.Q. had, at entry, declined less (in comparison with the I.Q.'s of children of older entry ages) rather than to differences in program efficiency at various chronological ages. Length of EIP treatment was not found related to gains in tested I.Q. Similar gains in I.Q. were observed in children whether they experienced one or more years in EIP. Losses were not observed to follow gains made early in EIP programs.
- o The distribution of I.Q. scores obtained by EIP subjects at exit approached a normal probability curve, with a mean of approximately 5 points less than the test norms. A bimodal distribution observed at entry was no longer apparent at exit.

3) Language Development

- o EIP treatments were not found to have different effects on language (ITPA) development in comparison with children in various control groups. However, the EIP educational programs were found to be significantly more effective if continued for 2 school years or more in comparison with a one year EIP intervention. Also, the EIP programs resulted in significantly greater ITPA gains among experimental children when they were enrolled for two or more years with an entry age of four (in comparison with other lengths of treatment and ages of entry).

4) Academic Performance

- Children in EIP programs were found to perform significantly less well than children at the end of the first year of primary school (normally called first grade). By the end of the second or third year of EIP ungraded primary experience, EIP pupils on the average scored higher (on most sub-tests of the MAT) than their controls, but the differences were non-significant. EIP children did not (on the average) achieve above the national MAT norms.
- Losses in position relative to MAT norms were experienced by EIP pupils after departure from EIP programs and entry to the public schools. Control children showed similar losses relative to the MAT norms. EIP graduates in the first and fourth grades of public school were not significantly different in MAT performance from their public school matched controls.
- Age of entry did not appear to be a factor in these findings, however, most of the children entering EIP at 2, 3, or 4 years of age had not reached the second or third year of the elementary school when the project was terminated. Readiness data on the graduates of the Infant Project (now aged 4 and 5) suggest that these subjects are likely to perform in a superior fashion at entry to public school. Since they will not enter EIP ungraded primaries, it will not be possible to test the effects of the EIP primary programs on children who have been observed and tested since birth and educated in EIP pre-schools since two years of age. Their EIP experience will end when they complete kindergarten in the spring of 1971.

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